NEW HAVEN COAL POLICY STUDY

Prepared for
The City of New Haven, Connecticut
Office of Downtown and Harbor Development

by

envirosphere company
A Division of EBASCO SERVICES INCORPORATED
Two World Trade Center, New York, NY 10048

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PREFACE

Faced with the uncertainties associated with energy demands, oil pricings and availability and the commitment to establish a sound basis for port development through planning, the City of New Haven, Connecticut as part of its Coastal Program undertook this Coal Policy Study. As world energy markets change, influencing oil prices and availability, coal demands in the region served by the New Haven Port could increase. Should coal demand increase, it is possible that coal would be stored within the Port of New Haven.

This study provides the City of New Haven with a basis for planning for coal terminal development in New Haven.

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SECTION I

INTRODUCTION

A. PURPOSE OF STUDY

A comprehensive, however qualitative and generic approach guided the preparation of this study which assesses: whether and where coal terminal development is likely to occur within New Haven Port; most likely coal storage systems, should coal terminal development occur; adverse impacts associated with coal terminal development and operation, and mitigative measures to reduce impacts; relevant existing management and regulatory mechanisms; and, coal terminal development guidelines and evaluative criteria that may be used by project developers and reviewers. This study concludes with an assessment of the management and regulatory framework which would govern coal terminal development at New Haven Port.

B. SUMMARY OF FINDINGS

The selection of a site, and the design and scale of a coal terminal is dependent upon a number of considerations. Based on an assessment of the most important of these considerations, it was found that at present there is little likelihood that a coal terminal facility would locate in New Haven. However, with changes in the availability and pricing of oil, increased oil conservation measures and technological innovation, the demand for coal within the region served by New Haven could increase. Given these circumstances, two types of coal terminals could locate in New Haven. Both a low development scenario (10,000 tons storage requirement) and a medium development scenario (50,000 tons storage requirement) are considered in this study.

For both scenarios it was determined, based on a number of considerations, that two coal storage methods--open ground storage and silo storage--would be the most likely coal storage systems to be utilized. The land area requirements for the low and medium coal storage

scenarios are 3 acres and 10 acres respectively. Within the New Haven port area nine sites were evaluated for their capability to accommodate coal terminal development. Based on a number of considerations it was found that two sites could potentially accommodate a low scenario terminal and one site could potentially accommodate a medium scenario coal terminal.

Environmental impacts associated with coal terminal development are assessed. Mitigative measures that may reduce the deleterious consequences of coal terminal development are also assessed. The management and regulatory framework comprised of laws, programs, policies, guidelines and standards at all levels of government established by the Connecticut Coastal Management Act, and the comprehensive program created through its enactment, to integrate the myriad of authorities with which projects, (such a coal terminal development), must comply was found to be potentially effective.

Development guidelines to reduce the liklihood of negative consequences, as well as evaluative criteria that may be used for planning purposes, and review of coal terminal proposals, are presented. This study concludes with recommendations by the authors.

C. USE OF THIS STUDY

This study may be useful for coal terminal planning and assessment purposes. Planners and other individuals concerned with New Haven Port will consider this study to be a reference and working document that serves as a foundation for coal terminal development planning and assessment. Potential coal terminal developers may utilize this study as a checklist in the project planning and licensing processes. Project reviewers may use this study to assist in the assessment of coal terminal proposals.

SECTION II

PROJECTED COAL FACILITY DEVELOPMENT IN NEW HAVEN

A. ECONOMIC ANALYSIS AND PROJECTED COAL DEMAND

1. National Domestic Coal Demand

In 1975, national domestic coal demand (consumption) was almost 563 million tons. Of this total, the electric utility industry consumed about 406 million tons or 72.1 percent of the total, as shown in Table II-1. By 1980, national domestic coal consumption reached a level of almost 703 million tons, a 25 percent increase over 1975. This increase in coal consumption was precipitated by the electric utility industry and is attributed to new additions of coal-fired capacity to their generation bases. In 1980, electric utility coal consumption expanded to a level of 569 million tons or 81 percent of the total domestic consumption, which is a 40 percent increase over the 1975 consumption levels.

Between 1980 and 1982, overall national coal consumption remained almost constant, attaining a level of 707 million tons in 1982. This leveling off of coal consumption was attributed to a very small growth in coal-fired electrical generation, coupled with a decline in industrial, commercial, and residential (I/C/R) consumption, which was induced by the economic recession of 1980-1982. Nevertheless, during this time period, the electric utility industry enhanced its position as the dominant consumer of coal.

In 1983, national coal demand is projected to increase to 740 million tons, which is a 4.7 percent increase over 1982. By 1985, national coal demand is forecasted to increase by almost 115 million tons to a level of about 855 million, which translates into a 15.5 percent increase over the 1983 level. The electric utility industry is projected to experience a 9 percent increase in coal demand from 1983 to 1985, (615 million tons to 670 million tons), while the I/C/R sector is projected to experience a 42.5 percent increase during this same period (125 million tons to 184 million tons). Increases in

coal consumption for the two sectors is based upon the anticipated recovery of the nation's economy, and the addition of new coal-fired capacity by the electric utility industry.

By 1990, national coal demand is forecasted to reach a level of slightly more than 1 billion tons, which is a 24 percent increase from 1985. The electric utility industry in the 1985-1990 time period is projected to expand to a level of almost 827 million tons, a 23.3 percent increase over 1985 demand levels. The projected increase in the electric utility sector is based upon the planned additions of new coal-fired capacity, through new construction and coal conversions. During this same period, the I/C/R sector is projected to reach a coal demand level of about 235 million tons, which is a 27.6 percent increase above the 1985 level. The projected increase in this sector seems to be based upon industrial fuel switching coupled with the anticipated commercial operation of synthetic fuel facilities.

2. New England and Connecticut Coal Demand

From 1975 to 1981, New England coal consumption remained almost constant, and reached an upper level of 1.8 million tons, as shown in Table II-2. The major consumer of coal in the region was the electric utility industry, which consumed between 1.3 to 1.4 million tons annually. During this same period, total coal consumption in the State of Connecticut fluctuated, as shown in Table II-3, however, even with these fluctuations, annual coal consumption did not exceed 37,000 tons, with almost all coal being consumed by the I/C/R sector.

By 1985, regional coal demand is forecasted to reach a level of 3.5 million tons, which is almost a 105 percent increase from the 1981 consumption level. The main factor behind this increase in regional coal demand, is the planned conversion of oil-fired facilities to coal by the region's electric utilities. Of the projected 3.4 million tons of coal required to meet regional electric utility demand, about 2.1 million tons will be consumed by facilities

earmarked for conversion.

Within the State of Connecticut, almost 1.1 million tons or 52 percent of the 2.1 million tons earmarked for conversion within the region are projected to be required by Northeast Utilities' Devon Plant and United Illuminating's Bridgeport Harbor Plant.

By 1990, regional coal demand will escalate to 11.3 million tons, a 220 percent increase over the 1985 level. As in 1985, the region's electric utilities are expected to be the principal catalyst for this increase in coal demand due to the planned addition of new coal-fired capacity and coal conversions.

The State of Connecticut's electric utility coal demand will also increase as a result of the planned conversion of Northeast Utilities' Norwalk Harbor plant. This planned conversion will add about 900,000 tons to the State's electric utility coal demand, contributing to a total State electric utility demand in 1990 of almost 2.0 million tons.

B. POTENTIAL FOR COAL FACILITY DEVELOPMENT

1. Electric Utilities Demand

As a result of the oil embargo of the 1973, Congress created the Energy Supply and Environmental Coordination Act of 1974 (ESECA). The main purpose of this act was to reduce the nation's dependence on foreign oil, specifically oil used in the electric utility sector. The effect of this act on Connecticut utilities was the identification of five (5) power plants as candidates for coal conversion. The five candidate power plants are as follows: Northeast Utilities' Norwalk Harbor, Devon, Montville and Middletown plants and United Illuminating's Bridgeport Harbor plant. These five plants by 1990 would generate a coal demand of almost 3.0 million tons annually. Since this identification, many of the identified power plants have been deleted from the annual listing. Of the five plants earmarked for conversion in Connecticut, two have been deleted: Montville and Middletown.

The remaining three plants (Norwalk Harbor, Devon and Bridgeport Harbor) were all built with facilities to receive coal by water directly, which involves no other transshipment point. Presently, barged fuel oil is being received at all three plants, and with rehabilitation of conveyor and associated equipment, coal may be readily unloaded. Therefore, the prospects of New Haven to serving as a transshipment node or point for these three identified plants is unlikely.

On the otherhand, if the Middletown plant is redesignated for coal conversion, the potential exists for New Haven to become a transshipment point. A recent study (Osleeb and Ratick, 1981) determined that the optimal intra-regional flow of coal to the Middletown plant would be the shipment of approximately 2100 tons of coal per day from Providence to New Haven via collier. Once received at New Haven, the coal would be transshipped by rail for delivery to the plant. Therefore, if the Middletown plant is converted to coal, New Haven Port will be a strong candidate to receive and handle about 700,000 tons of coal annually, and would support the medium scenario, as shown in Table II-4.

2. Industrial, Commercial and Residential Demand

As stated previously, Connecticut's consumption of coal for the I/C/R sector has been somewhat erratic. Connecticut's percentage of the New England Region's total consumption within this sector averaged about 9.6 percent between 1975 to 1981. With the forecasts for this sector not expected to exceed 200 thousand tons in 1990, the future demand for coal in this sector for Connecticut will be small. It should be mentioned that most coal which is consumed by Connecticut users is shipped by truck from Pennsylvania to the end-user directly. In light of this forecast and the current mode of shipment, the potential for New Haven as a major transshipment point for serving the I/C/R sector is very small, and its throughput will probably not exceed 10,000 tons of coal per year. The low scenario shown on Table II-4 summarizes the characteristics of a coal terminal in New Haven for a facility of this scale.

TABLE II-1

NATIONAL DOMESTIC COAL DEMAND

(in million tons)

	Actual				Forecast		
	1975	1980	1981	1982	1983	1985	1990
Electric Utilities	406.0 (72.1)	569.3 (81.0)	596.0 (81.2)	594.0 (84.0)	615.0 (83.0)	670.3 (78.4)	826.8 (78.9)
I/C/R	156.9 (27.0)	133.5 (19.0)	133.0 (18.8)	113.0 (16.0)	125.0 (17.0)	184.2 (21.6)	235.1 (22.1)
TOTAL	562.9 (100.0)	702.8 (100.0)	729.0 (100.0)	707.0 (100.0)	740.0 (100.0)	854.5 (100.0)	1,061.9 (100.0)

Notes: 1. The numbers in parenthesis represent percentages of the total.

2. I/C/R is defined as industrial (including coke plants), commercial and residential end-uses.

Sources: U.S. Department of Energy, 1982, 1981 Annual Report to Congress - Volume 3 Energy Projections, and National Coal Association, 1983, Revised 1983 Forecast.

TABLE II-2

NEW ENGLAND COAL DEMAND

(in million tons)

	Actual			Forcast	
	1975	1980	1981	1985	1990
Electric Utilities	1.3 (86.7)	1.4 (77.8)	1.3 (76.5)	3.4 (97.1)	11.1 (99.1)
I/C/R	0.2 (13.3)	0.4 (22.2)	.04 (24.5)	0.1 (3.9)	0.2 (0.9)
TOTAL	1.5 (100.0)	1.8 (100.0)	1.7 (100.0)	3.5 (100.0)	11.3 (100.0)

Notes: 1. The numbers in parenthesis represent percentages of the total.

2. I/C/R is defined as industrial (including coke plants), commercial and residential end-uses.

Sources: U.S Department of Energy, annual, Coal Distribution (DOE/EIA-0125) and, 1982, 1981 Annual Report to Congress-Volume 3 - Supplement 2.

TABLE II-3

CONNECTICUT COAL DEMAND.

(in thousand tons)

	1975	1980	1981
Electric Utilities	*	*	*
I/C/R	24	16	37
TOTAL	24	16	37

Notes: 1. The asterisk (*) indicates less than 500 tons delivered to the end-use.

2. I/C/R is defined as industrial (including coke plants), commercial and residential end-uses.

Source: U.S. Department of Energy, annual, Coal Distribution.

TABLE II-4

POTENTIAL COAL TERMINAL DEVELOPMENT SCENARIOS AT NEW HAVEN

	Low Scenario	Medium Scenario
Annual throughput	10,000-100,000 tons	700,000 tons
Storage required	10,000 tons	50,000 tons
Area for coal storage	1 acre	4.4 acres
Auxiliary area (apron railyard, office, parking)	2 acres	4.1 acres
Gross area required	3 acres	8.5-10 acres acres
Depth	35 feet	35 feet
Vessels	25-30,000 DWT	25-30,000 DWT
Payload	Varies	16,700 tons
Ship visits/year	Varies	30-40
Unload rate	Varies	100 tons/hr
Unload duration	Varies	84 hrs (@ 16 hrs/day or 5.2 days)
Inland transportation	Trucks	Rail
Load/car (capacity)	Varies	90 tons
Load rate (time)	Varies	8 minutes/car
Load rate (load)	Varies	675 tons/hr
Average Daily cargo (Assumes 250 workdays)	400 tons	2000 tons

Source: Envirosphere Company

SECTION III
COAL FACILITY SYSTEMS

A. FACILITY COMPONENTS

A port oriented coal terminal is basically a facility to store coal and move it from one mode of transportaion to another. The scale and design of a coal terminal will dictate the major coal facility components and these are dependent upon a number of factors or considerations including:

- Location and nature of customers to be served
- Source and type(s) of coal to be marketed
- Coal throughput requirements
- Coal storage requirements
- Physical characteristics of the site and surrounding areas
- Transportation and services infrastructure
- Regulatory requirements

Coal terminals that export rather than import are typically larger facilities with an annual throughput of 5 million tons per year (5MTPY) or more serving either or both domestic and foreign customers. Typically, export terminals utilize unit trains to transport coal from mines to the port terminal area where a train unloading system (e.g., rotary dumper or hopper trestle) dumps the coal onto a conveyor system which moves the coal through weight and sampling stations and finally to a storage area where it is stacked. As coal colliers and or barges arrive at the terminal, they are moored at a berth adjacent to a pier or dock equipped with a ship loader. Coal is reclaimed from the storage area and moved via a series of conveyors by the shiploader which in turn loads the coal into the holds of a berthed vessel. Once fully loaded, the coal collier (or barge) departs to its final destination. An annual throughput in excess of 25 MTPY may be achieved utilizing this procedure.

Coal import terminals are usually smaller operations serving one or a number of customers within the region served by the port. There are basically four types of customers served by such a facility: (1) electric utilities; (2) industries; (3) institutions; and, (4) dealers. Of these, the electric utilities usually require the greatest volume of coal followed by industries, institutions, and dealers. For this study, potential coal terminal development in New Haven is assumed to be of the import terminal type and as mentioned earlier, of a small scale nature, within the 10,000 - 100,000 tons throughput capacity range (low scenario) or 700,000 tons throughout capacity (medium scenario).

Coal terminals of this type are not necessarily single purpose facilities as evidenced by the varied activities occurring at the New Haven Terminal which presently serves as a terminal for approximately 9,000 tons of anthracite coal as well as other commodities. At this "dealer type" facility, coal was unloaded from a ship, moved with front end loaders and piled up with a crane. Coal is transported to customers by truck. As a very small coal terminal (i.e., less than 10,000 tons throughput per year), New Haven Terminal is not equipped with special machines, conveyors, and facilities that are designed to unload, move, stack and reload coal quickly and efficiently.

In contrast, should a more active, larger (medium scenario), coal terminal facility (with an annual throughput of 700,000 tons with a ground storage requirement of 50,000 tons) locate in New Haven, special coal terminal facility equipment would be necessary. Major elements of such a facility are: ship/barge unloaders (e.g., crane equipped with a clamshell bucket or a barge unloader); coal transfer equipment (e.g. conveyors, trucks, front-end loaders); storage facilities, rail/truck loaders and ancillary facilities. The most prominent element of a coal terminal is the coal storage system. In terms of coal storage, a variety of coal storage methods may be used, and as with the other facility components, the choice of a particular storage method over another depends on the factors and considerations mentioned earlier.

B. COAL STORAGE ALTERNATIVES

Coal storage is often classified as active (live) or inactive (dead) although sometimes the two are combined. When kept separate, coal held in inactive storage is a reserve source utilized when the amount of coal held in the active stockpile is unable to meet demand. When separate storage occurs, the volume of coal held in inactive (dead) storage is usually significantly greater than the volume held in the short-term active stockpile. The following assumes combined storage. Four alternative coal storage systems considered are as follows:

1. Open ground;
2. Silos;
3. Slot; and
4. Covered buildings.

1. Open Ground Storage

Open ground storage is a common method for storing a variety of small as well as large volumes of coal and it is considerably more cost-effective than other storage methods. Storage piles are conical-shaped, wedge-shaped, or kidney-shaped depending on the methods of stacking and reclaiming to be used. Conical-shaped piles are stacked with a stationary stacking device (serviced by an inclined conveyor) or a crane, wedge-shaped piles are stacked with a travelling stacker (serviced by a conveyor running parallel to the pile) and kidney shaped piles are stacked with a radial stacker. Piles may be 60 feet or higher. Good soil bearing strength is necessary to support coal piles and up to 10 acres would be required to store 50,000 tons of coal in New Haven.

Proper consideration must be given to potential environmental risks associated with open pile storage. Fugitive particulate dust emissions from the storage pile and transfer points along the belt conveyor system may be reduced by wet suppression; conveyor galleries, covers and scrapers, and telescoping chutes.

Runoff from coal piles and equipment may be controlled as can leachate into groundwater systems. Visual and noise impacts could also be mitigated.

2. Silos Storage

Silos are another common method for coal storage particularly at coal mines, power plants and train loading stations. Silos are usually constructed from poured in place concrete. The largest silos used today have a capacity of 15,000 tons. Silos offer certain benefits in that there is a reduction in fugitive particulate dust emissions and runoff (since silos are covered) and they require less land per ton of coal (a typical silo in the U.S. is 70 feet in diameter and 200 feet tall). Because of the great loads imposed by silos, special foundations (pilings) are needed to support them and to accommodate underground tunnels (for conveyor systems) necessary to empty the silos.

There are also a number of disadvantages associated with silos. Spontaneous combustion presents a greater risk for silos (compared to open ground storage) and because coal stored in a silo "flows" in a "first in-first out" fashion, there can only be one type of coal stored per silo. Silos are more expensive to construct and operate because each silo needs appropriate stacking and reclaiming conveyors. From a cost effectiveness standpoint, there are no economies of scale as the storage demand capacity for the facility increases, because the marginal cost per ton will increase (as construction costs for new silos increase) or remain constant.

A variation to the silo is the eurosilo which until just recently has been mainly used to store potato starch and soy beans. Eurosilos are larger in diameter and shorter than the typical silos; therefore their loads are distributed over larger areas thereby reducing the foundation problems associated with the typical silo. In elevation they look like petroleum storage tanks. Eurosilos have a 50,000 ton capacity and it has been reported that the utilization of Eurosilo as a coal storage system may be economical up to 80,000 tons (e.g., two Eurosilos at 40,000 tons each).

3. Slot Storage

Slot storage is typically used at power plants and mines and resembles a trough (which is excaved) covered with a roof. Coal is loaded into the slot by a belt conveyor that is slung under the roof over the trough. Coal is reclaimed by a tunnel that is located at the base of the trough. Slot systems are economical in the 22,000 - 100,000 tons range of storage capacity and offer the benefits of covered coal storage systems. Spontaneous combustion and excavation at a water-front site (where the groundwater table may be encountered) represent problems with slot systems.

4. Covered Buildings

Covered buildings present the most expensive coal storage system with the most difficult technical problems to overcome. Spontaneous combustion and the tendency for coal piles to emit methane gas (which is poisonous and flammable), together with the fugitive particulates that would be generated during the movement of coal, all create complex problems for personnel and facility safety that are difficult to overcome. Further, interior supports are not recommended (since they increase the risk of spontaneous combustion and interfer with the circulation patters of heavy equipment) and the structural costs associated with clear spans are very high. As a whole, covered buildings are not used because they are inefficient operations that present insurmountable problems in terms of safety and code compliance.

C. SUITABLE COAL STORAGE FACILITY TYPES FOR NEW HAVEN

The coal storage system selected for a port coal terminal must be economical, efficient in operations and suitable for the environment within which it will operate. Four coal storage methods were evaluated for their relative suitability in New Haven. Open ground, silos/eurosilos, slots, and covered buildings are commonly used coal storage systems, however each has its particular advantages, disadvantages and application. As mentioned earlier,

the design and scale of the coal terminal is dependent upon a number of factors and considerations. In the case of projecting the most suitable coal storage system for New Haven, a number of assumptions were established as follows:

- Low and Medium storage/throughput scenarios possible (See Table II-4)
- Import type coal terminal
- Waterfront or near waterfront site possible
- Minimal environmental impacts
- Reasonable capital investment possible
- Consistency with Federal, State and local laws, programs, goals and policies

Table III-1 presents a summary comparison of the alternative coal storage systems considered for New Haven. Based the assumptions stated above, open ground storage and silos were considered to be the most suitable coal storage methods for New Haven.

TABLE III-1

SUMMARY COMPARISON OF ALTERNATIVE COAL STORAGE SYSTEMS
FOR
NEW HAVEN

COAL STORAGE METHOD	RANGE OF COAL STORAGE VOLUME FOR WHICH METHOD IS MOST APPLICABLE	SPECIAL REQUIREMENTS	ADVANTAGES	DISADVANTAGES	RELATIVE SUITABILITY FOR NEW HAVEN PORT
1. Open Ground	o No Limit o 4000 - 30,000 tons/acre for storage area only	o Good soil strength o Water runoff control o Fugitive dust control	o "Low" storage scenario may not require special requirements o Economical to build/operate o A variety of coals may be stored in different piles o Flexibility in operation o Marginal benefit if amount of coal stored increases (cost/ton stored decreases) o Spontaneous combustion can be controlled easily	o Necessary environmental controls an added cost - Water runoff/treatment - Fugitive dust mitigation - Aesthetic impact mitigation o Requires large land areas for piles	o Suitable with impact mitigation plan for low or medium storage scenario
2. Silos/Eurosilos	o 10,000 - 50,000 tons per silo o Economical system when used for up to 80,000 tons o Up to 60,000 tons/acre for storage area only	o Foundation system o Tunnel/Conveyor system for each silo required o Spontaneous combustion preventive measures may be necessary	o Minimal environmental controls necessary o Minimal land areas o Cleaner operation than open ground storage	o Special equipment necessary o Expensive compared to open ground storage (cost/ton stored) o Marginal benefit (cost/ton) does not accrue o Only one variety of coal may be stored in each silo o Inflexible in operation - coal flows in a "first in-first out" basis o Spontaneous combustion is a greater risk for silos (when compared to open ground storage)	o Suitable for low or medium storage scenario

TABLE III-1 (Cont'd)

COAL STORAGE METHOD	RANGE OF COAL STORAGE VOLUME FOR WHICH METHOD IS MOST APPLICABLE	SPECIAL REQUIREMENTS	ADVANTAGES	DISADVANTAGES	RELATIVE SUITABILITY FOR NEW HAVEN PORT
3. Slot Storage	o 22,000 - 100,000 o Approximately 140 tons/linear foot	o Foundation system o Tunnel/Conveyor system required o No groundwater near surface - excavation necessary	o Minimal environmental controls necessary o Cleaner operation than open ground storage	o Special equipment necessary o Expensive compared to open ground storage (cost/ton does not diminish o Only one (1) variety of coal may be stored in each slot o Inflexible in operation - coal flows in a "first in-first out" basis o Spontaneous combustion is a greater risk for slots (when compared to open ground storage o Large (long) land area required	o Not suitable - groundwater would be encountered at port sites - Large/long sites not available
4. Covered Buildings	o Up to 45,000 tons o Larges reported: 45,000 tons (building is 212 feet wide 700 feet long 115 high)	o Special long-span structure o Fire resistant construction o Special ventilation	o Minimal Environmental controls necessary	o Very expensive o High risks for fire o Ventilation system complex o Inflexible operation o Would pose difficulties in complying with regulatory requirements - Occupational - Building	o Not suitable

Souce: Envirosphere Company

SECTION IV

POTENTIAL COAL STORAGE SITES IN THE PORT OF NEW HAVEN

A. GENERAL PORT DESCRIPTION

For purposes of this analysis, the port area of New Haven includes New Haven Harbor, the Quinnipiac River up to Ferry Street Bridge, and the Mill River up to the Chapel Street Bridge. A 35 foot deep channel bisects the harbor, making it suitable for deep-water port traffic. The Quinnipiac and the Mill Rivers have been dredged to a depth of 16 feet and 12 feet respectively, enabling barges to penetrate these waters.

The Port area currently supports a range of industrial, commercial, residential and recreational facilities. Zoning in the port area reflects current uses on the northern and eastern perimeters of the harbor, and planned uses for the western shoreline which is largely undeveloped at present. Permitted zoned uses for the western port area are a mixture of commercial, industrial and recreational uses.

The northern and eastern harbor areas consist predominantly of heavy industrial, residential and recreational uses. They are dotted with tank farms owned by Mobil, Texaco, Gulf, Wyatt, Hess, Arco, T.A.D. Jones, Exxon and ELMCO. Other industries maintaining facilities in the eastern and northern sections of the Port include East Coast Environmental Services, Suzio Cement, Atlantic Cement, Bigelow Boiler and US Steel. In addition, United Illuminating maintains a generating facility in the Port, adjacent to a city-owned sewage treatment plant.

Roughly half of the eastern harbor shoreline from Ferry Street Bridge to Lighthouse Point is bordered by parkland comprising East Shore Park, Fort Hale Park and Lighthouse Point Park. The other half of the shoreline is given over to industrial facilities. The northern reach of the port, stretching from the Chapel Street Bridge to the Ferry Street Bridge consists of industrial facilities and Quinnipiac Park.

As was mentioned previously, the western shoreline of the harbor is largely undeveloped. However, the City of New Haven anticipates and is encouraging high-quality commercial development along this coastline. An example of the kind of development which is going into this area is a condominium project called Harbour Landing. Each unit is selling for an estimated $175,000.

The existing land uses within the harbor and the proposed development plans of the City of New Haven for the western shoreline were carefully considered in developing a methodology for identifying potential suitable sites for coal storage within the port. The following is a discussion of the methodology and assumptions which were used to locate potential sites.

B. METHODOLOGY

The present demand for coal does not require the storage of coal at New Haven. However, given the ever fluctuating price of oil and the general uncertainty of energy supplies in the world economy, it is conceivable that at some time there will be sufficient demand for coal in Connecticut to warrant the development of coal storage areas at New Haven. In developing a method for identifying potential suitable sites, three objectives were considered. They are:

1. The need to minimize or mitigate potential negative impacts of coal storage.

2. The need to provide access from water borne vessels to the storage site and from there to the end-user.

3. The need to provide adequate surface area for storage within the port confines.

The first objective, addressing potential impacts, reflects not only the requirements of existing state and federal regulations, such as the Clean Air Act, and the Connecticut Water Pollution Control Act, but also local concerns and zoning regulations.

The City of New Haven is very sensitive to the aesthetic impacts of coal storage facilities. Large, highly visible piles of coal stored in the port area would negatively affect the program currently underway to attract high-quality commercial development along the western shoreline. Moreover, the City is aware that the storage of coal has been shown to be generally a less profitable use of vacant land than other competing uses (Fay, Spofford and Thorndike). Therefore, it is important that if coal were to be stored in the port, that it not displace more profitable land uses and negatively affect other potentially developable port areas.

The second objective, concerned with coal storage site accessibility, necessitates the evaluation of potential sites in terms of proximity to harbor unloading facilities (notably docks, piers and or wharfs), and to transportation links from these unloading areas.

The third objective, dealing with surface area requirements for coal storage facilities, is based on the discussion in Section III of this study and local zoning regulations. The outdoor storage of coal in the Port would require a special exception under current zoning regulations. To obtain this exemption, the owner of the coal storage facility would have to meet certain criteria including the provision of adequate loading spaces on or immediately adjacent to the site. Therefore in addition to storage area, loading area requirements are considered.

These three objectives were applied during the site selection process and, in combination with an analysis of existing and future potential land uses in the Port, were used to select a total of nine potential coal storage sites. To assess potential future land uses, interviews with the Connecticut Petroleum Council, United Illuminating, New Haven Terminal and Suzio cement were conducted concerning their plans for the next 5 years. The nine potential sites range in size from 1-1/2 acres to approximately 30 acres. All are located in the northern and eastern port areas and all are in locations zoned for heavy industrial use. Seven of the nine sites would be suitable for storage of small volumes (10,000 tons storage) of coal (i.e., 10,000-100,000 tons annual throughout). Two would be suitable for storage of moderate volumes (50,000 tons storage of

coal (i.e. 500,000 tons annual throughout). The following is a brief description of each of the potential coal storage sites found within the Port of New Haven.

C. POTENTIAL COAL TERMINAL FACILITY SITES

Each potential coal storage site has been identified with a letter of the alphabet and is shown in Figure 1. A summary of site characteristics is presented in Table 1.

Site A

Site A is the largest of the nine sites and one of two sites capable of accomodating large volumes of coal (100,000-500,000 tons). It consists of the approximately 30 acres of open space located around the United Illuminating (UI) generating station. This site can be served by either the United Illuminating pier or the Exxon pier. Existing paved roads connect the site with interstate highways (I-95 and I-91). In addition, the site is serviced by a railroad connection. Adequate acreage exists for a loading zone. According to D Damer of UI, there are no plans to develop the open space around its plant, and the possibility of leasing it for coal storage is not out of the question. The principal disadvantage of this site is that because it is right on the shoreline, it is highly visible from the western shoreline and from traffic along I-95. Indeed, up until the 1960's, coal stored in open piles in the vicinity of the UI generating station was responsible for creating a "bad image" for the Port from an aesthetic point of view. The City still remembers the highly visible coal piles and would prefer not to repeat that experience (L Brown, Pers. Comm.).

Site B

The second site is located just behind and east of the United Illuminating property, near the existing sewage treatment plant. It is the second site which would be suitable for storing moderate amounts of coal. This area has approximately 10 acres of open space which could

also be served by either the UI pier or the Exxon pier. The site is accessible by existing roads and could accomodate a loading zone. Transporting coal from the piers to the site will be more costly than to sites located adjacent to shoreline unloading facilities.

Site C

Site C consists of scattered pockets of open space near the New Haven Terminal tanks. It is not very suitable for coal storage but is considered because it is on this property that coal is currently being stored. According to P Tarasovic of New Haven Terminal, there are 9,000 tons of anthracite currently stored on their property. This coal belongs to ORE and CHEMICAL. Given the difficulty ORE and CHEMICAL has had in selling off this coal, it is unlikely that new coal will be brought to this site by them. Approximately 3 acres of vacant land exist directly on the edge of the harbor and an additional acre exists farther east in a more interior portion of the property. The New Haven Terminal property is currently served by a large wharf and is readily accessible to roads. Because this site is so small, it could only accomodate a relatively small volume of coal. Even small amounts of coal stored on this site would pose difficulties. First of all the New Haven Terminal property is very crowded with existing tanks and storage facilities. The provision of space for coal storage and for loading spaces would severely restrict access to existing facilities on the property. In addition, the vacant area on the harbor's edge is directly within view of the western shoreline and I-95 and would therefore be visually intrusive.

Site D

Site D is a large wedge shaped area located behind and to the east of the New Haven Terminal property, extending along an existing city-owned right-of-way. This area of approximately 8 acres is currently being used to store lumber. It is an area which could be served by the Exxon pier or the New Haven Terminal wharf. The site is accessible by existing roads and a railroad, and could easily accomodate loading spaces. Site D is well screened from the western shoreline and is only partially visible

from I-95. However, transportation of coal from harbor unloading facilities to the site would be an added cost to develop a storage facility. Also the site's proximity to chemical storage tanks might neccessitate special fire protection measures.

Site E

This site is directly adjacent to and east of Site D. It consists of approximately 5 acres of open space and also could be served by the Exxon pier or New Haven Terminal wharf. Site E is accessible by existing roads and a railroad. Like Site D, this site has the advantage of being screened from sensitive areas. Unfortunately, like Site D, this site will require the costly transport of coal from shoreline unloading facilities, a distance of roughly 1/2 mile.

It is possible that should the coal storage requirements warrant it, that Sites D and E could be combined into one site.

Site F

This site is located on the harbor's edge between the Gulf and Getty oil tanks and the T.A.D. Jones tanks. It consists of approximately 3.5 acres of open space and is adjacent to the Gulf Oil Corporation wharf. The site was recently purchased by Gulf which will probably wish to expand their facilities on it. Site F is conveniently located near existing roadways. The principal drawbacks of this site is its high visibility from the western shoreline and I-95, and its potential development by Gulf.

Site G

Sit G consists of approximately 7 acres of open space surrounding the Suzio cement plant along the Mill River. This site has access to the Blakeslee-Arpaia wharf which is next to and parallel to the I-95 crossing of New Haven harbor. This site is adjacent to both existing roadways and railroads. It is well screened from the western shoreline and could be

partially screened from I-95. However, it is directly visible from Quinippiac Park. At present, Suzio Cement hopes to develop its available acreage as a commercial and recreational marina. Only if these plans fail will they consider leasing their open space for coal storage.

Site H

The eighth site is located just to the south of the Mobil tanks which, in turn, are located at the mouth of the Quinnipiac River. This site consists of approximately 4 acres and could be served by the Getty or Texaco piers. It is also accessible by roadway and is screened from the western shoreline. Ships transporting coal would probably have to off-load onto barges which could negotiate the 16 foot depth of the Quinnipiac River.

Site I

The final site is located on the shores of the Quinnipiac River, adjacent to the Texaco tanks and just north of US Steel. It is approximately 5-1/2 acres in size. It can be served by the Texaco pier and is accessible by roadway. It is screened from both I-95 and the western shoreline, but is visible from Quinnipiac Park. Like site H, coal may have to be off-loaded onto barges to reach this site.

D. IDENTIFICATION OF THE MOST PROMISING SITES

Based on our overview of these 9 sites, it appears that the most promising sites for the low demand facility are sites D and E. The most promising site for the medium demand facility appears to be site B; although with careful screening, portions of site A may also be successfully developed.

TABLE IV-1

POTENTIAL COAL STORAGE SITE CHARACTERISTICS

SITE	LOCATION & ACERAGE	PRINCIPAL ADVANTAGES	PRINCIPAL DISADVANTAGES
A	UI property - 30 acres	excellent accessability, plenty of vacant space available.	visual intrusion-site is highly visible.
B	Adjacent to sewage treatment plant - 10 acres	good accessability, well-screened.	site surrounds sewage treatment plant.
C	New Haven Coal Terminal property. 3-4 acres (scattered)	excellent accessability, currently used for coal storage.	site is very crowded with existing structures, open space is not continuous but in pockets. Site is highly visible.
D	Adjacent to right-of-way-8 acres	good accessability, well-screened.	site is currently used to store lumber. Proximity to chemical storage tanks. Approximately 1/2 mile from pier.
E	Adjacent to site D - 5 acres	good accessability, well-screened.	site is approximately 1/2 mile from existing pier.
F	Between Gulf and T.A.D. Jones tanks - 3.5 acres	excellent accessability.	visual intrusion-site is highly visible. Gulf probably wants to use site.
G	Suzio cement property-7 acres	good accessability.	competing uses exist. Site visible from I-95, Quinnipiac Park.
H	Adjacent to SE boundary of US Steel property - 4 acres	moderate accessability, well-screened.	coal may have to be transferred to barges to reach site.
I	Adjacent to Texaco tanks - 5 1/2 acres	good accessability.	coal may have to be transferred to barges to reach site. Site visible from Quinnipiac Park.

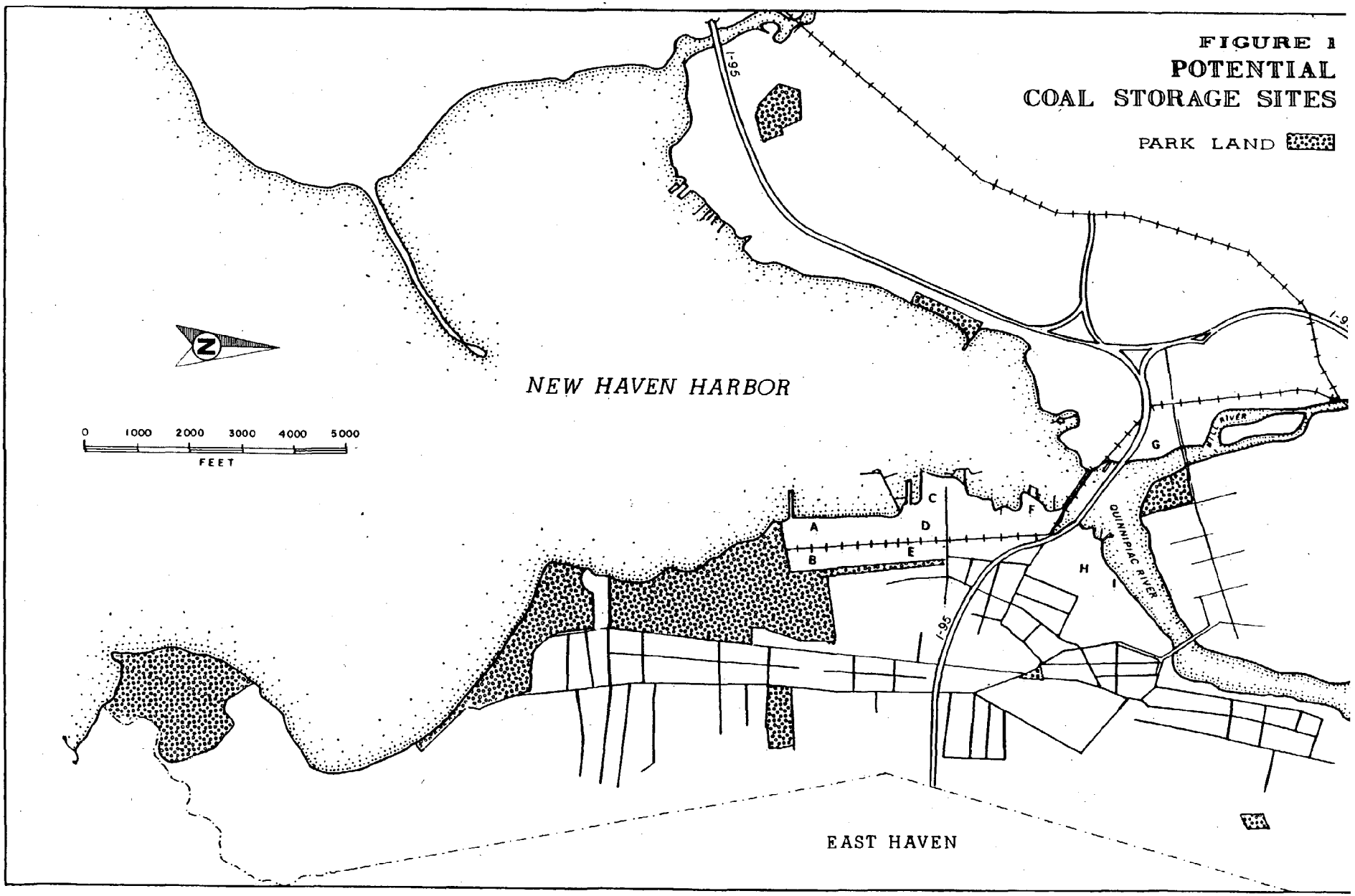
FIGURE 1
POTENTIAL
COAL STORAGE SITES
PARK LAND
N
NEW HAVEN HARBOR
0 1000 2000 3000 4000 5000
FEET
I-95
I-95
I-95
A
B
C
D
E
F
G
H
I
QUINNIPIAC RIVER
EAST HAVEN

SECTION V

IMPACT ASSESSMENT OF COAL STORAGE FACILITY ACTIVITIES

A. COAL CHARACTERISTICS

Coal is a combustible sedimentary rock composed of a complex group of substances consisting primarily of carbon, hydrogen and oxygen compounds, and volatile matter. Most of the volatile matter consists of water and hydrocarbons. Coal is located in 38 states in the United States, and varies greatly from location to location in heating value, ash content, moisture and chemical properties.

One of the commonly accepted methods of coal characterization is the classification of coal by rank, developed by the American Society for Testing Materials (ASTM). This classification by rank is based on the progressive response of a particular coal to pressure and/or heat, and represents the percentage of moisture, fixed carbon, volatile matter of the coal and its calorific value. Table V-1 presents these characteristics for anthracite, bituminous, subbituminous and lignite.

Coal also contains numerous trace elements, such as boron, manganese, copper, iron and silica. Trace element concentrations in coal vary widely with location and even within a single coal seam.

Notwithstanding these differences in coal, certain common environmental impacts can be expected with the transporting, handling and storage of coal. The extent and magnitude of these impacts is dependent upon the type and volume of coal, the transport, storage and handling methods used; and the mitigation measures employed. For the purpose of clarity, the discussion on impacts is presented in two sections. In the first section, impacts on different sectors of the environment are generally described. In the second section, the impacts associated with specific coal storage activities and possible mitigative measures are described.

B. SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

Coal storage facilities generate atmospheric, terrestrial, aquatic and aesthetic impacts. Most of the impacts can be minimized with use of proper mitigative measures. The following is a general description of the more significant environmental impacts associated with coal storage facilities:

1. Air Quality Impacts

Air emissions that are common to most coal storage facilities occur in the form of fugitive dusts from open storage piles, and from the transporting of coal from one location to another. In addition, fugitive dusts are generated as a result of traffic around the coal terminal facility. Some minor quantities of gaseous pollutants are also released to the atmosphere from the coal storage piles and from trains, trucks and barges.

The release of fugitive dust emissions from coal piles, coal-handling, and vehicle movement is semicontinuous in nature and is, therefore, significant in terms of environmental impact. The amount of fugitive dust emitted from open storage piles depends on certain factors, including:

1. Meteorological conditions (wind, speed, humidity and temperature)
2. Local topographical conditions
3. Size of the coal pile and configuration of the coal pile
4. Moisture content and bulk density of the coal
5. Amount of rain
6. Mitigative measures taken to control the dust emissions

The amount of dust emitted from loading and unloading operations depends upon the amount of coal being transferred, the rate it is being transferred, coal size, moisture content of coal and type of equipment being used. The least amount of particulate emission is associated with silo storage systems and enclosed conveyors. The greatest amounts of

particulate emissions are from open coal storage piles with truck unloading and rotary bucket reclaiming systems. The volume of coal dust particles released when coal is unloaded from incoming vessels and then loaded unto trucks departing from the terminal facility also varies. Again, the amount of dust released will depend upon the volume of coal being handled, the size of coal, the type of coal, the moisture content and the handling methods used.

Not much is known about how coal dust effects the environment. What little data is available focuses on human health and plants. Generally speaking, the concern from a human health point of view is with the effect of coal dust on the respiratory system. Coal dust acts as an irritant in and of itself. In addition, coal dust can combine with other pollutants to form secondary pollutants such as sulfate aerosols which are also respiratory irritants.

Coal dust may reduce air quality by releasing volatile substances to the atmosphere, which can also affect vegetation. Coal dust will deposit on vegetation and clog the stomates of leaves, lowering photosynthetic activity and causing leaf necrosis. This in turn will reduce plant productivity. In general, fugitive dust, including wind-blown coal dust is subject to Federal, state and local air quality standards.

2. Terrestrial Impacts

Depending upon the size of the coal-handling facility, there will be a loss of approximately between 3 to 50 acres of land to support that facility. The value of this lost land needs to be considered in terms of its environmental characteristics, as well as in terms of other competing uses which might have been realized had the coal terminal not been built. As part of the construction of the coal terminal, the terminal site has to be stripped of all existing vegetation and graded. The magnitude of the impact resulting from loss of this vegetation and related soil erosion will depend upon the size and characteristics of the

area selected for construction but will be for all intents and purposes permanent. Other possible terrestrial impacts resulting from a coal storage facility include:

1. Dust depositon on adjacent vegetation, resulting in reduced photosynthetic activity.
2. Possible increased susceptibility of plants to parasites and disease as a result of dust deposition.
3. Possible localized accumulation of trace elements in soils.
4. Possible biomagnification of trace elements in the food web.

These impacts are discussed below

In the preceeding section, the direct effect of dust on plant productivity was described. In addition, dust can weaken plants by reducing photosynthetic activity and thereby increase their vulnerability to pathogens and parasites.

In addition to the impact of reducing photosynthetic levels as a consequence of dust deposition, dust can also change the chemical properties of soil and may affect plants utilizing that soil. The degree to which soils are affected is, to some extent, dependent upon the buffering capacity of the soil. In humid regions where soils are generally acidic, additions of alkaline coal dust may lead to an increase in soil pH. If such increases exceed the pH range of tolerance of native plant species, changes in vegetation can occur. Moreover, changes in soil pH can affect the availability of certain elements, such as phosphate, iron and manganese to plants growing in this soil.

Coal dust may also release small amounts of trace elements to the soil which could, potentially, be toxic. The degree of toxicity is dependent upon the interaction of many factors, including the properties of the trace elements, the soil and the plants; and environmental parameters, such as temperature and precipitation. These elements may be concentrated in living tissues as they are consumed up the food chain. At this time, all of the effects of trace elements on soils are not known.

A final important impact on the terrestrial environment from construction and from transportation is the compaction of soil and the generation of fugitive dust which can clog the interstitial spaces of the soil and prevent perculation of rain, resulting in increased runoff.

3. Water Quality Impacts

The impact of coal storage facilities on salt or fresh water quality can be divided into two general areas. The first area is those impacts which result from the construction and maintenance of the coal terminal facility. The second, is those impacts which result from the handling and storage of coal in general. The most important impacts resulting from these two categories are briefly described below.

With respect to water quality impacts resulting from construction activities, the principal area of concern is the increase in turbidity resulting from the resuspension of sediments, or the deposition of increased sediment as a consequence of facility activities. The resuspension of sediments by dredging and ship traffic can cause a significant increase in the turbidity of a water body. Increased turbidity as a result of construction activities stems from increased erosion and surface runoff of soil particles. Suspended solids due to resuspension average nearly five times the usual concentration of suspended solids in water. These resuspended sediments sometimes release toxic materials, as well as increasing turbidity, causing the disturbance and destruction of benthic organisms and habitat, resulting in changes in species composition, distribution and abundance. Increased turbidity may cause a reduction in overall biological productivity in a water body by cutting down the amount of light penetration. This decrease in light penetration can cause a reduced rate of photosynthetic activity among aquatic vegetation. Also, turbidity may affect fish spawning grounds and habitat. Specifically, the following effects on fish may be anticipated:

1. Fish populations and their development and growth rates, as well as reproductive rates, might be reduced due to the lowered amount of food available.

2. Behavioral patterns of fish can change as a consequence of the mechanical disturbances associated with vessel loading and unloading.

3. Fish may seek to avoid turbid areas to prevent their gills from being clogged and relocate elsewhere, if possible.

Less mobile benthic organisms may be displaced or destroyed as a consequence of increased turbidity which may clog their respiratory and feeding surfaces. The importance of these benthic organisms for the entire aquatic food web is well recognized. Benthos are important ecologically because they serve as food for fish and other benthic organisms and are essential in the decomposition of organic sediments.

Loading, unloading and handling operations also have significant effects on water quality. Coal piles produce coal pile runoff and leachate which are potentially significant water quality pollutants. Drainage quality and quantity varies depending on the meteorological conditions, size of the coal pile, the area of the coal pile and the type of coal used. However, generally speaking, coal pile runoff contains coal fines, humic acids and inorganic ions, and may be quite acidic. Table V-2 presents coal pile leachate characteristics. The aquatic effects of this leachate in water bodies can be severe. Low pH, abnormal ion concentrations and particulate matter can negatively effect the benthic, planktonic and fish populations. To some extent, contamination of water by coal storage pile runoff is similar to effects caused by acid-mined drainage. Damage to aquatic life from acid mine drainage results from a combination of low pH, a concentration of metals and sulphates and the deposition of a blanket of ion hydroxide precipitates. The trace elements released into the aquatic ecosystem from runoff are accumulated by both aquatic vegetation and benthos. Phytoplankton absorb trace elements to their cell walls, as well as absorb them. These trace elements are then passed on through the food chain. Higher level consumers then accumulate the trace elements from the water and food in their tissues.

To the extent that coal pile leachate can have the same impact on the aquatic ecosystems as acid-mined drainage, the following potential impacts can be expected:

1. Blanketing of benthos.
2. Loss of spawning and feeding grounds.
3. Reduction of both plants and animals as a consequence of increased concentrations of trace elements.
4. Decreased activity of aquatic plants as a result of increased turbidity and trace element accumulation.
5. Bioaccumulation (especially in the presence of low pH which increases trace element soluability and thus allows plant uptake).
6. Altered physiology of aquatic invertebrates (notably impact on osmoregulation modification, respiration, shell disposition, growth and development, reproduction).
7. Altered physiology of fish, including intereference with neurophysiological, enzymatic and hormonal systems; increased susceptibility to disease, parasites and predators; reduced growth and development; reduced reproductive potential; and reduced species density and diversity.

The source of coal-related pollutants in the aquatic system is not limited to leachate only. Coal dust deposited on surface waters may also increase the turbidity of the waterway. Fugitive coal dust deposition may also contribute to slight, but significant chemical changes in the aquatic system. Reduced pH can strip some trace elements from bonding sites on organic and inorganic complexing agents. This process can enhance the solubility of certain trace elements, thus allowing uptake by aquatic organisms. Some trace elements taken up this way may be particularly toxic to aquatic biota.

4. Aesthetic Impacts

The aesthetic impacts associated with coal storage facilities result primarily from the actual visual impact of the facilities themselves, the noise of operating the loading and unloading equipment, and the dust associated with handling the coal.

The extent of visual impact resulting from the coal facilities depends largely on the type of storage selected. Large silos and coal piles will be visible from considerable distances, depending on the local topography. In New Haven, an area which is relatively flat, any of the large-scale storage options would have a negative visual impact. However, this impact can be mitigated by careful treatment of the most visible structures with paint colors which help to blend them into the existing environment. Smaller storage facilities would probably be concealed by either existing structures or by landscaping plans.

There are three basic sources of noise which radiate from coal transfer facilities. They are: traffic noise (trains, barges, ships, trucks); coal-handling equipment noise (conveyors, bulldozers, stackers, reclaimers); and coal impact noise.

The level of noise generated by these facilities will depend upon the quantity and quality of noise generated, distance of the noise generator to residential or natural communities, the ability of the surrounding terrain to buffer noise and the sensitivity of exisiting land uses in the vicinity.

The vehicular noise resulting from train, truck or car movement will be fairly infrequent and should not constitute a major disturbance.

Coal-handling equipment which is involved in the loading, unloading, transfering, and stockpiling of coal and which most frequently generates noise includes:

1. Dumping trucks
2. Engine motors
3. Engine fans
4. Winches for railcar positioning
5. Barge or shiploaders
6. Rotary dumpers

7. Conveyors
8. Crushers
9. Feeders
10. Bulldozers
11. Stackers or reclaimers
12. Whistles and cells

The noise levels of major pieces of coal facility equipment are presented in Table V-3.

Coal impact noise originates when coal is dropped into empty railcars, barges, conveying transfer points and storage bins. The noise levels generated by coal impacting is related to the material on which the coal is dropped. Proper housing and covering of facilities can greatly reduce the amount of noise generated from coal.

In addition to the visual impact of the terminal facility equipment, and the noise impact resulting from the operation of this equipment, there is another aesthetic impact which may be caused by fugutive dust. Such dust is dark in color and is usually considered visually disturbing. However, with proper dust control measures, described in the following section, the levels of fugitive dust should be minimal.

C. POTENTIAL IMPACTS OF SPECIFIC FACILITY ACTIVITIES AND MITIGATIVE MEASURES

Coal storage facility activities can be divided into three categories: Construction, on-site handling, and transportation.

The construction activities will probably include:

1. Dredging of channels to accomodate coal transshipment
2. Disposal of dredge spoil material
3. Pier and/or wharf construction
4. Shoreline modification and/or stabilization
5. Land clearing and grading
6. Operation of construction equipment and supplies vehicles

The on-site handling activities will probably include:

1. Ship loading and unloading
2. Rail, truck loading
3. Stockpiling, reclaiming

The transportation of coal will probably include:

1. Ship transport
2. Rail movements
3. Truck transport

Generally speaking, the environmental impacts associated with each of these activities will depend upon site characteristics, the quantity of coal, the quality of coal, its moisture content, the type of equipment used and the mitigative measures employed. Table V-4 presents a list of environmental impacts, which have been documented, by coal storage terminal activitiy. The table also presents mitigative measures which have been successfully implemented to reduce these environmental impacts. Appendix I presents additional information concerning air quality, water quality and noise quality controls (mitigative measures).

Most of the environmental impacts associated with coal storage facilities are in fact regulated by federal, state and municipal regulations. Fugitive dust emissions, noise levels, water quality impacts for example are regulated and have to meet specific standards. The following section discusses those regulations which relate to coal storage terminal activities.

TABLE V-1
CLASSIFICATION OF COALS

Class	Moisture %	Fixed Carbon Limits, %*	Volatile Matter Limits, %*	Calorific Value Limits, Btu/lb**
Anthracite	2	86-98	2-14	14,000-16,000
Bituminous	2-15	50-86	14-50	10,500-14,000
Subbituminous	20-30	40-60	-	8,300-10,500
Lignite	30-50	40	-	6,300-8,300

* Dry mineral-matter-free basis

**Moist mineral-matter-free basis.

Source: US Department of Commerce.

TABLE V-2

COAL PILE LEACHATE CHARACTERISTICS

Parameter	Range (mg/l)
pH	2.1 - 3.0
Iron	0.17 - 93,000
Sulfate	525 - 21,920
Dissolved Solids	720 - 44,050
Copper	1.6 - 3.4
Zinc	1.6 - 23.0
Chromium	0 - 15.7

Source: Michigan Dept. of Natural Resources.

TABLE V-3

ESTIMATED NOISE LEVELS OF UNIT OPERATIONS

WITHIN COAL TERMINAL FACILITIES

Unit Operation	Noise Level dB(A)	Distance (m)	Reference
Unloading Train			
Bottom dump*	59	12	
Rotary dump	60	12	
Loading Ship			
Shuttle conveyor**	75	15	
Storage			
Stockpile conveyor	65	15	
Bulldozer activity and reclaiming process	75-95	15	
Construction Activities			
Pile Drivers	100	15	
Earth moving equipment and smaller stationary equipt. (compressors, generators, etc.)	75-90	15	
Reclamation Equipment***			
Feeder	75	0.9	
Vibrator	110	0.9	
Operation facility****	77	15	

* This is an estimate for the rotary dump unloading facility based on the bottom dump facility. Both methods produce noise from coal impact, ventilation systems, and winches for car positioning.

** This is an estimate based on comparison with a traveling stacker.

*** 105B feeder and P160 vibrator manufactured by Eriez Magnetics, Erie, Pennsylvania.

**** An estimate of total noise generated by a barge loading facility on the Ohio River, Burlington, OH. Equipment includes large trucks, loaders, bulldozers, truck dump, barge-loader, vibrating screens, crushers, conveyors, motors, fans, motor noises from tow boats.

Source: US Dept. of Commerce.

TABLE V-4
POTENTIAL COAL STORAGE TERMINAL IMPACTS

ACTIVITY	POTENTIAL IMPACTS	MITIGATIVE MEASURES
I. CONSTRUCTION		
1. Dredging and Disposal	Increased turbidity, decrease in water quality. Resuspension of sediments. Displacement or disruption of benthos community. Displacement of fish. Loss of habitat. Alteration of local hydrology. Increase in noise.	Schedule dredging during periods of least organism activity, and least vulnerabily (i.e. avoid spawning seasons). Machinery used should be efficient and well maintained to minimize turbidity. Use turbidity curtains where appropriate. Disposal options should avoid sensitive estuarine and terrestrial areas; where possible use dewatered spoil in construction. Limit work to daylight hours to lessen impact of noise.
2. Shoreline Construction (including piers, shores stabilization)	Increased erosion causing increased turbidity. Resuspension of sediments. Displacement of benthos community. Loss of habitat. Release of trace elements from metal pilings. Increase in noise as result of pile drivers, construction equipment.	Use turbidity curtains where appropriate. Schedule shoreline construction during periods of least biological activity. Limit work to daylight hours, use dampening or shielding devices.
3. Site Preparation (clearing, grading, construction)	Increased fugitive dust, gaseous emissions. Increased erosion. Contamination of adjacent water bodies. Increase in noise. Loss of habitat. Visual intrusion.	Adequate wetting of critical construction areas and roadway to reduce dust. Tarping or wetting down of vehicles transporting earth. Planting of fast growing crops to stabilize barren areas. Control surface run-off collect and treat. Limit work to daylight hours, use baffles and noise supressing devices such as structural dampening or shielding Develop a buffer zone.
II. ON-SITE HANDLING		
1. Coal Loading/unloading	Increased fugitive dust emissions.	Adequate dust collection, enclosure of equipment and wetting of coal, proper grooming and wetting of coal piles.
2. Stockpiling	Increased turbidity, decrease in water quality. Visual intrusion. Increase in noise.	Contain run-off and leachate. Construct a buffer zone. Shield or enclose noise generators, dampen equipment, reduce friction through adequate maintenance, install baffles.

TABLE V-4 (Cont'd)
POTENTIAL COAL STORAGE TERMINAL IMPACTS

ACTIVITY	POTENTIAL IMPACTS	MITIGATIVE MEASURES
III. COAL TRANSPOTATION		
1. Ship Transport	Increased erosion of shoreline. Resuspension of sediments. Decrease in water quality. resulting from bilge discharge.	Establish and enforce speed limits. Provide shoreline protection/Gabion, rip-rap, sheet pile, or vegetation. Pump noxious bilge waste into onshore recepticles.
2. Rail Transport	Increase in noise from diesel locomotives. Increase in fugitive dust. Interference with vehicular traffic. Visual impact.	Use rail mufflers, welded rails. Schedule transport for daylight hours. Use wind guards, seal each load with latex-polymer, wet the coal. Update switching to reduce unnecessary delays at RR crossings. Plant vegetative buffer zone along RR right-of-way.
3. Truck Transport	Increase in noise. Interference with vehicular traffic. Increase in fugitive dust and gaseous emissions. Road degradation.	Install mufflers, exhaust pipe wraps, double wall or laminated exhaust pipes. Schedule transport for off-peak traffic daylight hours. Carefully route trucks; wet coal and seal with chemicals or tarpaulins. Properly maintain truck exhaust systems. Limit truck movement to roads designed for loads or modify roads where necessary.

Source: Envirosphere Company

SECTION VI

MANAGEMENT AND REGULATION OF COAL TERMINAL FACILITIES

A. EXISTING MANAGEMENT AND REGULATORY FRAMEWORK

To protect the health, safety and welfare of the public, legislators at the federal, state and local levels of government have enacted laws, programs, and policies, adopted codes and development guidelines, and prepared plans to manage and control man-made development in the natural environment. In general, the management and regulatory framework that governs development at each of the levels of government (federal, state and local) is designed to protect public interests as defined at each respective level. For example, Federal interests include national defense and national environmental protection while at the local level of government, aesthetics and compatible land uses are important concerns. Since many issues (water and air quality, as examples) are concerns at all levels of government, duplication and inconsistency have been avoided by enacting at the federal level, regulations, programs etc. which are applicable throughout the United States.

The coordination of management and regulatory mechanisms among the various government levels and agencies is an evolving process subject to legislative changes, government reorganizations, and the like, however there is, for the most part, a well established set of management and regulatory mechanisms that apply to all industrial facilities such as coal terminals and other significant developments. The following is a review of federal, state and local management and regulatory mechanisms that would govern the planning, development, construction and operation of a coal terminal in New Haven.

1. Federal Management and Regulatory Mechanisms

In 1899, the Rivers and Harbor Act was enacted by the federal government giving authority to the U.S. Army Corps of Engineers to

regulate virtually all development in navigable waters. Since then, a number of laws to protect the environment and interests of the nation have been enacted at the federal level. Table VI-1 presents a summary of major federal legislation applicable to coal terminal planning, development, construction and operation. The following is a brief description of the most relevant laws pertaining to coal terminals.

The Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 (RHA) requires that a U.S. Army Corps of Engineers permit be obtained for the construction of structures or for work in or affecting navigable waters of the U.S. For coal terminal projects, permits are required for channel dredging, pier and shoreline construction and other activities affecting navigable waters.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires any federal agency which is to license, permit, or otherwise authorize a proposed project, to consult with the U.S. Fish and Wildlife Service as well as any other agency administering wildlife resources in the project area, when a proposed project would control or modify a water body. The purpose of the consultation is to prevent loss of, or damage to, as well, as, where possible, to develop and improve, the wildlife resources in the project area. The Act defines wildlife resources broadly, to include birds, fish, mammals, and other wild animals, as well as the vegetation upon which the wildlife depend. Water impoundments of less than ten acres are exempted from the requirements of Act.

Endangered Species Act

The Endangered Species Act of 1973 requires the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to publish

lists of "threatened" or "endangered" plant and animal species (as defined by the Act), together with the species' critical habitats and the ranges over which they are threatened or endangered. These lists are amended continuously. Once listed, a species falls under the protective umbrella of the Act. The Act requires that all federal agencies ensure that their actions, (authorization or approval of proposed projects) do not jeopardize the existance of any listed species or result in the destruction or adverse modification of species' habitats. If it is determined that a threatened or endangered species may be present in the area of a proposed project, the Act requires that a biological assessment be conducted to determine if such a species is likely to be affected by the proposd project. This assessment must be reviewed for adequacy by the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service, and must be completed before any construction on a proposed project can begin.

National Historic Preservation Act

The National Historic Preservation Act of 1966 requires federal agencies which license or fund projects that would affect structures, sites, etc. listed, or eligible for listing in the National Register of Historic Places (Register) to take into account the effects of the proposed project on such structures, sites, etc. The Register, which is maintained by the National Park Service, is an official list of archeological, historic, and architectural properties which have local, state, or national significance. Both the state and the federal government nominates properties for inclusion in the Register. Nominations are approved by the National Park Service. In addition, various agencies of the federal government can add properties to the Register. In Connecticut the Historical Commission reviews projects for their potential impact on cultural resources.

Clean Water Act

The Federal Water Pollution Control Act of 1972 as amended by the Clean Water Act of 1977 (CWA) establishes a comprehensive program to regulate pollutant discharges into surface waters of the U.S. This program is implemented primarily through the discharge permit program of CWA Section 402, which is called the National Pollutant Discharge Elimination System (NPDES). The NPDES permit, which must be obtained before any discharges into surface waters commence, is the mechanism by which specific effluent limitations and management practices are established for each discharger. These effluent limitations are determined based on compliance with all applicable federal and state technological and water quality requirements. There are special additional requirements for discharges into the ocean.

The CWA also includes provisions which require:

1. state certification that a proposed source will comply with CWA and state water quality requirements, before the issuance of any federal permit or license;

2. preventive and clean up measures for spills of oil and hazardous substances into waters of the U.S.;

3. a permit, pursuant to Section 404 for planned dredge and fill activities in navigable U.S. waters is issued by the US Army Corps of Engineers. The Connecticut Department of Environmental Protection (DEP) processes NPDES permit applications and state certifications.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act of 1976 (RCRA) is intended to promote the protection of public health and the environment through the development of improved solid waste management techniques. Controls to be implemented through RCRA focus upon preventing the contamination of surface and ground water supplies. The statute places emphasis upon the creation of resource recovery and resource conservation systems as alternatives to the current practices of disposal of solid wastes. Water

retention areas storing runoff from coal piles could trigger a review pursuant to RCRA.

National Environmental Policy Act

The National Environmental Policy Act of 1970 (NEPA) represents the first comprehensive statement of the U.S. Government which expresses a national environmental policy. The major provision of NEPA which applies the development of coal terminals is contained in Section 102 (2)(c) of the Act. This section states that all agencies of the federal government shall:

> "include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement... on (i) the environmental impact of the proposed action, (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved if the proposed action should be implemented."

The key works in the above statement are" ...include a detailed statement..." for "...major federal actions significantly affecting the quality of the human environment..." From this paragraph stems the requirement for federal agencies contemplating major actions to prepare an environmental impact statement (EIS). If it is determined that an EIS will be required, NEPA requirements have a significant impact on the data requirements and front-end scheduling of new coal terminals.

In the case of coal terminals, the requirement for a federal EIS may be triggered by the necessity for an applicant to obtain one or more federal permits or approvals. Two (2) permits that frequently trigger an EIS are:

- Permit for discharge of dredged or fill material into waters of the U.S. (Section 404 of the CWA).

- Permit for construction in navigable waters of the U.S. (Section 10 of the Rivers and Harbors Act)

Noise Control Act

The Noise Control Act of 1972 as amended, gives the Environmental Protection Agency (EPA) authority to establish federal standards for major sources of noise in the categories of construction, transportation, electrical, and electronic equipment, and any motor or engine. So far EPA has promulgated standards for rail cars and locomotives (40 CFR 201), motor vehicles (40 CFR 202), portable air compressors (40 CFR 204), and medium and heavy-weight trucks (40 CFR 205). Manufacturers normally design their equipment to comply with most of these noise standards, although some of the standards apply to equipment operation (not design). The standards obviously apply to certain coal terminal activities.

Clean Air Act

The Clean Air Act of 1970 as amended in 1977 (CAA) is intended to protect and enhance the quality of air in order to protect public health and welfare. The CAA creates important restrictions on the siting of new coal terminals. For coal terminals the CAA is implemented primarily through permit programs for the construction of major new sources. These permit programs ensure source compliance with national ambient air quality standards (NAAQS), requirements to prevent further deterioration of existing air quality where the NAAQS's are being met, national emission standards (which are based most fundamentally on technological capability), national emission standards (for certain hazardous air pollutants) and visibility protection requirements. In Connecticut the Department of Environmental Protection (DEP) is responsible for ensuring compliance with air standards.

Coastal Zone Management Act

The Coastal Zone Management Act of 1972, amended and reauthorized in late 1980, provides for federally-approved state coastal zone management (CZM) plans to regulate uses within the coastal zone. The coastal zone is comprised of coastal waters and adjacent shore lands bordering the Long Island Sound as defined by the State of Connecticut.

The federal Coastal Zone Management Act requires that all federal actions (i.e., programs, development projects, and administrative actions such as the issuance of permits) be consistent with the State approved coastal zone management plan. The Department of Environmental Protection (DEP) is responsible for reviewing federal actions for consistency, however federal agencies also conduct their own evaluation as part of their normal decision making process. The Coastal Zone Management Act provided the State with authorities to enact a State Act which contains a comprehensive set of management and regulatory authorities that require federal actions to be consistent with State polices adopted to protect natural resources in the coastal areas. In the consideration of all permit decisions, federal agencies are required to be consistent with the policies adopted by the State of Connecticut (Table VI-2).

2. State and Municipal Management and Regulatory Mechanisms

Connecticut's Coastal Management Act (CCMA) (PA 78-152 as amended by PA 79-535) is a comprehensive management and regulatory framework comprising all single purpose management and regulatory mechanisms enacted at the state level. The CCMA is governed by a set of general goals and policies; those which apply to coal terminal development are shown in Table VI-3.

A coal terminal proposal in New Haven, depending on its scale, design and site orientation could trigger some or all of these mechanisms but in any event, all State (and municipal) agencies are required to consider (as part of their criteria for issuance or non-issuance of a permit) a uniform set of criteria or policies as shown in Table Vl-4.

The number of State agencies and management/regulatory authorities that would be involved and triggered by a coal terminal at New Haven Port would depend on the activities associated with such a proposal. Table VI-5 presents a listing of uses and activities that are managed and regulated at the State and municipal government level. For each management/regulatory mechanism, a summary of provisions is also provided.

New Haven Zoning Ordinance

Development of a coal terminal at New Haven would be an allowable use in areas designated for heavy industrial uses, however a special exception would be required. Special exceptions may be granted by the Board of Zoning Appeals if the proposed development is found to be in accord with the public convenience and welfare after taking into consideration the items listed in Table VI-6. The Board of Zoning Appeals refers requests for special exceptions to the City Plan Commission which prepares an advisory report to be submitted to the Board of Zoning Appeals which has authority to grant, grant with conditions, or deny a special exception request.

A coal terminal proposed for New Haven would also be subject to a "coastal site plan review" in accordance with the provisions of the Connecticut Coastal Management Act as amended. State law and the New Haven zoning ordinance would require that an application for coastal site plan review be submitted by the project sponsor. Section 55 of the New Haven zoning ordinance stipulates that an application shall include:

1. A plan in accordance with subsections 11(c) and 12(b) of the Connecticut Coastal Management Act, as amended, showing the location and special relationship of the coastal resources on and contiguous to the site;

2. A description of the entire project with appropriate plans, indicating project location, design, timing and method of construction;

3. An assessment of the capability of the resources to accomodate the proposed use;

4. An assessment of the suitability of the project for the proposed site;

5. An evaluation of the potential beneficial and adverse impacts of the project; and

6. A description of the proposed methods to mitigate adverse effects on coastal resources.

The proposal must demonstrate that the adverse impacts are "... acceptable and consistent with the goals and policies of the Connecticut Management Act."

Adverse impacts are defined by the Connecticut Coastal Management Act as follows:

- Degrading water quality through the significant introduction into either coastal waters or groundwater supplies of suspended solids, nutrients, toxics, heavy metals or pathogens, or through the significant alteration of temperature, PH dissolved oxygen or salinity.

- Degrading existing circulation patterns of coastal waters through the significant patterns of tidal exchange or flushing rates, fresh water input, or existing basin characteristics and channel contours.

- Degrading natural erosion patterns through the significant alteration of littoral transport of sediments in terms of deposition or source reduction.

- Degrading natural or existing drainage patterns through the significant alterations of groundwater flow and recharge and volume of runoff.

- Increasing the hazards of coastal flooding through significant alteration of shoreline configurations or bathymetry, particularly within high-velocity flood zones.

- Degrading visual quality through significant alteration of the natural features or vistas and viewpoints.

- Degrading or destroying essential wildlife, fin fish or shell fish habitat through significant alteration of the composition, migration patterns, distribution, breeding or other population characteristics of natural species or significant alteration of the natural components of the habitat.

- Degrading tidal wetlands, beaches and dunes, rocky shorefronts, and bluffs and escarpments through significant alteration of their natural characteristics or function.

The City Plan Commission is charged with conducting the coastal site plan review and making a recommendation to the Board of Zoning Appeals to approve, deny or approve the proposal with conditions. In conducting its assessment, the City Plan Commission must comply with the following criteria established by the CCMA.

> In addition to determining that the activity proposed in coastal site plan satisfies other lawful criteria and conditions, a municipal board or commission reviewing a coastal site plan shall determine whether or not the potential adverse impacts of the proposed activity on both coastal resources and future water-dependent development activities are acceptable.
>
> In determining the acceptability of potential adverse impacts of the proposed activity described in the coastal site plan on both coastal resources and future water-dependent development opportunities, a municipal board or commission shall:
>
> 1. Consider the characteristics of the site, including the location and condition of any of the coastal resources defined in Section 3 of this Act.
>
> 2. Consider the potential effects, both beneficial and adverse, of the proposed activity on coastal resources and future water-dependent development opportunities.
>
> 3. Follow all applicable goals and policies stated in Section 22a-92 of the General Statutes, as amended by Section 2 of this Act and identify conflicts between the proposed activity and any goal or policy.
>
> Any persons submitting a coastal site plan as defined in Subsection (b) of Section 11 of this Act shall demonstrate that the adverse impacts of the proposed activity are acceptable and shall demonstrate that such activities are consistent with the goals and policies in Section 22a-92 of the General statutes, as amended by sections of this Act.
>
> A municipal board or commission approving, modifying, conditioning or denying a coastal site plan on the basis of the criteria listed in Subsection (b) of this section shall state, in writing, the findings and reasons for its action.

Approving any activity proposed in a coastal site plan, the municipal board or commission shall make a written finding that the proposed activity, with any conditions or modifications imposed by the board:

1. Is consistent with all applicable goals and policies in Section 22a-32 of the General Statutes, as amended by Section 2 of this Act.

2. Incorporate any conditions or modifications, all reasonable measures, which would mitigate the adverse impacts of the proposed activity on both coastal resources and future water-dependent development activities.

The City Plan Commission submits its coastal site plan and advisory report to the Board of Zoning Appeals for a final administrative determination and public hearing.

3. Assessment of Existing Management and Regulatory Framework

The Connecticut Coastal Management Program would integrate and coordinate management and regulatory mechanisms at the federal, state and municipal levels of government. Under the Program, the State would review coastal plan evaluations conducted by each level of government where a permit decision is made, to ensure that State goals and policies are conformed with in manner consistent with law. Since any coal terminal proposal in New Haven would trigger a number of regulatory mechanisms, a coastal site plan review is assured. The Connecticut Coastal Management Progam therefore represents a comprehensive and effective management and regulatory framework for coal terminal development at New Haven Port.

This framework is enhanced by the "nuisance laws" and "police powers" of the City of New Haven. In addition to a zoning ordinance, the City has a set of codes that address fire hazard, water quality, air pollution and other impact areas and each establishes development standards with which coal terminal proposals would have to be consistent.

B. DEVELOPMENT GUIDELINES

Local management of coal terminal development and operation can be further enhanced during the early stages of project planning if desirable development guidelines are made known to the project sponsor prior to the licensing/regulatory review processes. Development guidelines are distinguished from regulatory standards in that the former are harder to enforce and usually, unless stipulated as a condition to a permit, are not complied with. Development guidelines also serve as a checklist and basis to evaluate proposals during review processes (eg, coastal site plan review).

For the most part, development guidelines are inherent to the existing regulatory review processes. For example, the goals and policies of the Connecticut Coastal Management Program are development guidelines with which coal terminal project proposals must be consistent. Both standards and guidelines are well established at the state and federal levels of government. For example the Connecticut Department of Environmental Protection (DEP) has established regulatory standards for New Haven Harbor water quality under the SB classification (Table VI-7) and the US Environmental Protection Agency has established national ambient air quality standards (Table VI-8) for particulate matter (this standard would be applicable to a coal terminal facility which is a source of fugitive dust). These, and other published regulatory standards represent existing development guidelines with which a project must comply.

A coal terminal sponsor should be cognizant of these required standards and development guidelines since the project proposal will be evaluated in terms of these criteria during the regulatory review processes. In order to enhance conformance with coastal policies (guidelines) and regulatory standards, a coal terminal sponsor may also wish to comply with the recommended development guidelines presented in Table VI-9.

The recommended development guidelines represent a planning tool as well as a "notice of expectations" for proposed coal terminal development. Project sponsors should be apprised early in project planning stages, before permit applications are prepared, that the manner in which project planning is conducted is as important to the project review process as the final project outcome. Project sponsors should be encouraged to meet with port planners to discuss the project openly and to work together to identify issues and concerns of both parties. Mutual benefits will result from this interactive planning process.

C. CASE STUDIES

The following two (2) case studies present existing and planned port coal terminals. The first cast study presents a coal terminal developed at Hampton Roads, Virginia with no government planning occuring for the terminal prior to permit application submittals. Case Study No. 1 presents information obtained from the Findings of Fact, Permit Application No. 81-0406-01 prepared by the US Army Corps of Engineers.

The second case study is an example of coal terminal planning by government agencies. In 1982 the Washington Public Ports Association and the State (Washington) Department of Ecology conducted a study (Potential Coal Export Facilities in Washington: An Environmental Impact Analysis) "...to promote responsible and informed decision-making by state and local agencies, ports and project sponsors, and to enhance understanding for all persons interested in the issue of coal export planning and development..." Case Study No. 2 presents an example of pre-development site planning and the utilization of a simple issue evaluation process.

CASE STUDY NO. 1

US ARMY CORPS OF ENGINEERS
FINAL ENVIRONMENTAL ASSESSMENT OF PERMIT APPLICATION
FOR THE INSTALLATION OF A COAL-HANDLING FACILITY ON THE
SOUTHERN BRANCH OF THE ELIZABETH RIVER

1. Name of the Applicant: Higgerson - Buchanan, Incorporated

2. Location of the Proposed Work: The project is located on the Southern Branch of the Elizabeth River approximately 1/2-mile southwest of the Route 64 Bridge, off Bainbridge Boulevard in Chesapeake, Virginia.

3. Character of the Work: The applicant proposes to construct a coal storage and loading facility with an annual throughput of 5 to 9 million tons per year. In order to obtain a sufficient storage area for 160,000 tons of coal, the applicant proposes to fill 2.4 acres of wetlands. In addition, after-the-fact authorization is sought for the filling of 4.3 acres of wetlands since July, 1975. Of the total 6.7 acres of wetlands, 6.3 acres have been at least intermittently separated from tidal influence by the presence of man-made berms. To mitigate displaced wetlands, the applicant proposes to grade down an area on the western side of the Southern Branch and create 8.5 acres of saltmarsh and shallow water habitat. In order to construct the facility, the applicant proposes to hydraulically dredge approximately 425,000 cubic yards of sand and silt to a depth of 35 feet at mean low water from a triangular area east of the Southern Branch Turning Basin. The dredge spoil will be pumped to a nearby existing disposal area.

4. Purpose and Need: The purpose of the proposed project is to facilitate the export of coal by providing a means of transfer of coal from rail cars to ocean vessels. The project will help to alleviate the present congestion of colliers due to long waiting periods for loading.

5. Description of Area to Be Affected: The project is located in an industrialized section of shoreline on the Southern Branch of the Elizabeth River. Approximately 4.3 acres of irregularly-flooded wetlands, typified by the presense of saltmeadow hay, saltgrass, and tall cordgrass has been filled upon since 1975. Approximately two acres of similar habitat remains to be filled.

   Approximately 0.4 acre of saltmarsh cordgrass is proposed to be filled upon to expand the coal storage area. The site to be developed has been intermittently separated from tidal influence by the presence of

man-made berms along the shoreline. The property is bordered by Foster Grant properties to the north and Davis Grain properties to the south. Property across the waterway remains in an undeveloped state, with mixed pine and hardwood forests on the upland and a wide saltmarsh cordgrass community bordering the waterway.

6. Probable Effects of the Proposed Work On:

a. Navigation, Present and Prospective: The project is located adjacent to, and will be connected to, the Federal Project Channel in the Southern Branch of the Elizabeth River. No adverse navigational effects are anticipated, however. Project coordinated with Engineering Division and Planning Division.

b. Flood Heights and Drift: No adverse effects are anticipated.

c. Shoreline Erosion or Accretion: No adverse effects are anticipated.

d. Fish and Wildlife Resources:

(1) Habitat Description:

(aa) Flora: See (5) above for habitat description of area to be filled upon and area to be mitigated.

(bb) Fauna: Fish in the waterway include white perch, spot and croaker. Invertebrates include the blue crab.

(2) Ecological Impacts of the Proposed Work: The mitigation proposal calls for the creation of 8.5 acres of regularly-flooded saltmarsh cordgrass to replace 6.7 acres of predominately irregularly-flooded saltmeadow hay. This should result in a tremendous increase in environmental productivity detrital availability and water quality enhancement.

e. Endangered Species: In accordance with Section 7 of the Endangered Species Act of 1973, no threatened or endangered species provided on the list, nor critical habitats, are expected to be affected by this project.

f. Water Quality: The buffering effect of the newly-created, regularly-flooded wetland may actually enhance the quality of the water in the area. Only short-term disruptions due to increased turbidity levels during dredging are anticipated.

g. Aesthetics: No adverse effects are anticipated.

h. Historic and Cultural Values: No knowns properties eligible for inclusion or included in the National Register of Historic Places are located in or near the permit area.

i. Recreation: No adverse effects are anticipated.

j. Socioeconomics: The facility is expected to increase the City of Chesapeake's tax revenues by at least $162,000. Each ton of coal exported is expected to contribute more than $18 in a secondary economic benefits to the area. The facility is also expected to employ approximately 35 people and will reduce the waiting time of coal colliers, thereby reducing energy waste and non-productive waiting costs. Pollution problems due to waste disposal from colliers will also be reduced.

k. Water Supply: The applicant has modified his proposal by installing wells on-site for dust suppression and other functions. This will reduce the potable water demand from 18 to 1 million gallons per year.

l. Energy Needs: The proposal will help to facilitate the shipment of coal to help meet the world's growing energy needs.

m. Possible Cummulative Impacts: No adverse cummulative impacts are foreseeable.

n. Alternatives To Be Considered: No alternatives are considered more practical for accomplishing project goals.

7. Adverse Environmental Effects Which Cannot Be Avoided Should the Proposal Be Implemented: The proposal will cause temporary disruption during dredging and construction activities. The net overall effects on the environmental productivity with the proposed mitigation plan should be favorable.

8. The Relationship Between the Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity: The project will increase both the site's economic productivity and the area's long-term environmental productivity by replacing irregularly-flooded wetlands, with regularly-flooded ones which are significantly more productive.

9. Any Irretrievable or Irreversible Commitments of Resources Which Would Be Involved in this Proposal Should It be Implemented: The project has already resulted in the destruction of 4.3 acres of irregularly-flooded wetlands, with another 2.4 acres of predominately, irregularly-flooded wetlands to be filled upon. This loss should be compensated for by the proposed mitigation plan.

10. Coordination: This project was first coordinated at the 11 June 1981 joint processing meeting.

CASE STUDY NO. 2

GRAYS HARBOR

STATE OF WASHINGTON

Public Sponsor(s): Port of Grays Harbor

Participants: Undisclosed

Consultants: Undisclosed

Principal

Regulatory Agency: Grays Harbor County

Project Description: The proposed project involves a 176-acre site which has historically been used as a dredged material disposal site. The project is defined as a joint coal/grain export facility. The receiving track provides for two-unit coal trains and an inside loop is designed for grain trains. Reclaiming of coal will be accomplished at the bottom of the coal pile through a tunnel. The pier will be pile supported, approximately 64 feet wide and 1,000 feet long, and will be connected to the onshore facilsity by a long trestle supporting a coal conveyor belt. (The port has tentatively identified a second 72-acre site at Terminal 2 as an alternative location for spot shipments of coal. The following discussions deal only with the larger site.)

Location: The site is located on the south shore of Grays Harbor, and is situated between the Newskah River and Charlie Creek between State Highway 105 and the Burlington Northern rail line to Markhan.

Capacity: The project is designed to handle up to 10 million tons annual throughout.

Setting: The site was used (from 1973 to 1981) as a disposal area for dredged material. The surrounding areas could be characterized as partially disturbed wood and meadow lands.

Land Use Designations: The Shoreline Management designation of the site and adjoining land areas is "Urban." However, the adjoining water areas are designated as "Conservancy" except the designation Navigation channel which is also "Urban." The proposed pier would be located in the conservancy environment. Docks, piers and other water-land connectors are a permitted use in the conservancy environment.

Public Facilities: The source of water supply for the site has not been determined. Electrical power will be provided by the Grays Harbor PUD No. 1. There are no public wastewater treatment facilities serving the site, and onsite treatment would probably be required. The Union Pacific mainline arriving from Chehalis/Centralia on the south shore would probably serve the site.

Constraints:

- Existing channel depths (-30 feet MLW) are restrictive. Major dredging would be required.
- A harbor line change is required.

Opportunities:

- Grays Harbor has a self-maintaining bar and entrance channel. No maintenance dredging is projected for that area.
- Grays Harbor is served by two mainline railroads.
- All land use designations for the site and surrounding area indicate an industrial use.
- The site is located in an air quality "attainment" area.

GRAYS HARBOR EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Non-Issues
Earth		
Changes to local topography	o	
Surface compaction	o	
Alteration of longshore transport	o	
Air		
Elevated dust emissions	o	
Emissions from ships, trains and other vehicles	o	
Water		
Modification of hydrologic regimes	o	
Elevated levels of runoff	o	
Degradation of adjacent surface waters by windblown dust	o	
Increased turbidity due to dredging/ disposal	o	
Flora and Fauna		
Degradation of adjacent wetland habitat	o	
Degradation of adjacent aquatic habitat	o	
Degradation of adjacent terrestrial habitat	o	
Disruption of corridors and fish migratory pathways	o	
Rare of endangered species impacts	o	

GRAYS HARBOR EVALUATION OF IMPACT ISSUES (Cont'd)

Impact Categories	Potential Impact Issues	Minor or Non-Issues
Other		
Noise pollution	o	
Light and glare generation	o	
Alteration of land use designations		o
Potential for onsite accidents	o	
Potential for ship accidents	o	
Traffic congestion at grade crossings	o	
Increased demand for public services		o
Increased demand for utilities	o	
Asethetic impact	o	
Disruption of recreational/commercial fishing	o	
Disruption of general recreational activities		o
Archaeological/historical resource impacts		o
Competing uses for land and shoreline		o

D. EVALUATE CRITERIA

Once a coal terminal proposal is formally submitted to the City for consideration it will be subject to a "special exception advisory report" and a "coastal site plan review." The evaluative criteria presented in Table VI-6 are used for the special exception determination. For the coastal site plan review, the City evaluates a proposal in terms of its consistency with the general goals and policies of the coastal program (Tables VI-3 and VI-4) and an evaluation of positive and negative impacts. The evaluative criteria presented in Table VI are intended to assist project reviewers in assessing the effects of a coal terminal development proposal during both its construction period and operation.

TABLE VI-1

MAJOR FEDERAL LEGISLATION APPLICABLE TO COAL TERMINAL PLANNING, DEVELOPMENT, CONSTRUCTION, AND OPERATION

LEGISLATION/IMPLEMENTING AGENCY	BRIEF DESCRIPTION
Law Rivers and Harbors Act 33 U.S.C 401-413 Lead Implementing Agency U.S. Army Corps of Engineers	o Permits are required for dredge and fill activities and construction in navigable waters of the U.S. o Projects must be consistent with flood control, river and dam projects of the U.S. o Projects may not interfere with navigation necessary for national defense.
Law Ports and Waterways Safety Act P.L. 92-340 Lead Implementing Agency U.S. Coast Guard	o Seeks to prevent damage to resources, structures in, on or immediately adjacent to navigable waters of the U.S.
Law Fish and Wildlife Coordination Act P.L. 85-624 Lead Implementing Agency U.S. Fish and Wildlife	o Modifications to bodies of water that may result in loss or damage to fish and wildlife are subject to review and modification in order to prevent or reduce extent of loss or damage.
Law Endangered Species Act P.L. 93-203 Lead Implementing Agency U.S. Fish and Wildlife and National Marine Fisheries Service	o An identification of rare and endangered aquatic and terrestrial species that may be affected by a proposed project is required. Any threat to rare and endangered species must be minimized.

TABLE VI-1 (Cont'd)

LEGISLATION/IMPLEMENTING AGENCY	BRIEF DESCRIPTION
Law National Historic Preservation Act P.L. 89-665 Lead Implementing Agency National Park Service	o Negative effects to important historic or cultural resources must be avoided if possible.
Law Federal Water Pollution Control Act As Amended By The Clean Water Act Lead Implementing Agency U.S. Environmental Protection Agency	o National Pollutant Discharge Elimination System (NPDES) permits are required for any point source discharge into federal waters.
Law Resource Conservation and Recovery Act (RCRA) P.L. 89-272 Lead Implementing Agency U.S. Environmental Protection Agency	o Solid hazardous waste storage and disposal must comply with stringent standards; monitoring is required.
Law National Environmental Policy Act (NEPA) P.L. 89-190 Lead Implementing Agency U.S. Environmental Protection Agency	o Major federal actions (e.g., issuance of a federal permit) significantly affecting the quality of the human environment require the preparation of an Environmental Impact Statement (EIS). Environmental Impact Assessments (EIA) must be undertaken to determine if an EIS is necessary.
Law Noise Control Act P.L. 92-574 Lead Implementing Agency U.S. Environmental Protection Agency	o Noise standards to protect the health and welfare of the public are established.

TABLE VI-1 (Cont'd)

LEGISLATION/IMPLEMENTING AGENCY	BRIEF DESCRIPTION
Law Clean Air Act P.L. 91-604 as amended by P.L. 92-157 P.L. 93-15 P.L. 93-319 P.L. 95-95 Lead Implementing Agency U.S. Environmental Protection Agency	o Ambient air quality standards have been established which are a basis for assessing pollutant emissions. o New Source Performance Standards (NSPS) and regulations for the Prevention of Significant Deterioration (PSD) may affect terminal siting and design. o Best Available Control Technology (BACT) for the mitigation of pollutant emissions from sources may be required. o Lowest Achievable Emission Rates (LAER) may be required for terminals locating in non-attainment regions.
Law Coastal Zone Management Act P.L. 92-583 as amended by P.L. 94-370 Lead Implementing Agency National Oceanic and Atmospheric Administration	o Coal terminal development must be consistent with the State of Connecticut Coastal Zone Management Plan.
Executive Order Floodplain and Wetland Executive Orders	o Wetlands and floodplains are deemed to be important considerations and as such are to be evaluated prior to a federal action (issuance of a permit).

Source: Envirosphere Company

TABLE VI-2

STATE OF CONNECTICUT POLICIES THAT MUST BE CONSIDERED BY ALL FEDERAL AGENCIES IN PERMIT DETERMINATIONS FOR COAL TERMINALS IN PORT AREAS

- To disallow any filling of tidal wetlands in nearshore, offshore and intertidal waters for the purpose of creating new lands from existing wetlands and coastal waters which would, otherwise, be undevelopable, unless it is found that the adverse impacts on coastal resources are minimal.
- To disallow new dredging in tidal wetlands, except where no feasible alternatives exist, and where adverse impacts to coastal resources are minimal.
    - i. To prevent tidal and circulation restrictions and, when practicable, to eliminate any such existing restrictions.
    - ii. To improve or have a negligible adverse effect on coastal access and recreation.
    - iii. To enhance or not unreasonably impair the visual quality of the shoreline.
- To require, as a condition in permiting-new coastal structures, including, but not limited to, groins, jettys or break waters that access to or are along the public beach below mean-high water, must not be unreasonably impaired by such structures, and to encourage the removal of illegal structures below mean-high water which unreasonably obstruct passage along the public beach.
- To manage estuarine embayments so as to ensure that coastal uses proceed in a manner that assures sustained biological productivity, the maintenance of healthy marine populations and the maintenance of essential patterns of circulation, drainage and basin configurations; to protect, enhance and allow natural restoration of eelgrass flats, except in special limited cases, notably shell fish management, where the benefits accrue to alteration of the flat may outweigh the long-term benefits to marine biota, water fowl and commercial and recreational fin fisheries.
- To maintain, enhance or, where feasible, restore natural patterns of water circulation and fresh and salt water exchange and the placement or replacement of coverts, tide gates or other drainage or flood control structures.

Source: Connecticut Coastal Zone Management Act

TABLE VI-3

GENERAL GOALS AND POLICIES OF THE CONNECTICUT COASTAL MANAGEMENT ACT THAT APPLY TO COAL TERMINAL DEVELOPMENT AT PORTS

- To ensure that the development, preservation, or use of the land and water resources of the coastal area proceeds in a manner consistent with the capability of the land and water resources to support development, preservation or use without significantly disrupting either the natural environment or sound economic growth.

- To preserve and enhance coastal resources in accordance with the policies established by Chapters 439, 440, 447, 473, 474, 474a and 477.

- To give high priority and preference to uses and facilities which are dependent upon proximity to the water and the shorelands immediately adjacent to marine and tidal waters.

- To resolve conflicts between competing uses on the shorelands adjacent to marine and tidal waters by giving preference to uses that minimize adverse impacts on natural coastal resources while providing long-term and stable economic benefits.

- To consider in the planning process the potential impact of coastal flooding and erosion patterns on coastal development so as to minimize damage and destruction of life and property, and reduce the necessity of public expenditure to protect future development from such hazards.

- To coordinate planning regulatory activities of public agencies at all levels of government to ensure maximum protection of coastal resources while minimizing conflicts and disruption of economic development.

- To ensure that the state and the coastal municipalities provide adequate planning for facilities and resources which are in the national interest, as defined in Section 3 of this Act and to ensure that any restrictions or exclusions of such facilities or uses are reasonable. Reasonable ground for the restriction or exclusion of a facility or use in the national interest shall include a finding that such a facility or use:

  A. May reasonably be sited outside the coastal boundary

  B. Fails to meet any applicable Federal and State environmental, health or safety standards

TABLE VI-3 (Cont'd)

C. Unreasonably restricts physical or visual access to coastal waters. This policy does not exempt any non-Federal facility in use from any applicable State or local regulatory or permit program nor does it exempt any Federal facility or use from the Federal consistency requirements of Section 307 of the Federal Coastal Zone Management Act.

Source: Connecticut Coastal Zone Managment Act

TABLE VI-4

POLICIES THAT MUST BE CONSIDERED BY ALL STATE AND MUNICIPAL AGENCIES IN PERMIT DETERMINATIONS FOR COAL TERMINALS IN PORT AREAS

- To manage its uses in the coastal boundary through existing municipal, planning, zoning and other local regulatory authorities and to existing state structures, dredging, wetlands and other State siting and regulatory authorities, giving highest priority and preference to all dependent uses and facilities in shorefront areas.

- To promote, through existing State and local planning development, promotional and regulatory authorities, the development, reuse or redevelopment of existing urban and commercial fishing ports, giving highest priority and preference to all dependent uses, including, but not limited, to commercial recreational fishing and boating uses; disallow uses which unreasonably congest navigation channels or unreasonably preclude boating support facilities elsewhere in a port or harbor; and to minimize the risk of oil and chemical spills at port facilities.

- To require that structures in tidal wetlands and coastal waters be designed, constructed and maintained to minimize adverse impacts on coastal resources, circulation and sedimentation patterns, water quality, and flooding and erosion to reduce to the maximum extent practicable the use of fill, and to reduce conflicts with the riparian rights of adjacent land owners.

- To disallow the siting within the coastal boundary of new tank farms and other new fuel and chemical storage facilities which can reasonably be located inland and to require any new storage tanks, which must be located within the coastal boundary, to abut existing storage tanks or to be located in urban industrial areas and to be adequately protected against floods and spills.

- To require reasonable mitigation measures where development would adversely impact historical, archeological, or paleontological resources that have been designated by the State Historic Preservation Officer.

- To manage coastal bluffs and escarpments so as to preserve their slope and toe; to discourages uses which do not permit continued natural rates of erosion and to disapprove uses that accelerate slope erosion and alter essential patterns and supply of sediments to the littoral transport system.

TABLE VI-4 (Cont'd)

- To manage rocky shore fronts so as to ensure that development proceeds in a manner which does not irreparably reduce the capability of the system to support a healthy intertidal biological community; to provide feeding grounds and refuge for shore birds and fin fish, and to dissipate and absorb storm and wave energies.

- To preserve the dynamic form and integrity of natural beach systems in order to provide critical wildlife habitats, a reservoir for sand supply, a buffer for coastal flooding and erosion, and valuable recreational opportunities; to ensure that coastal uses are compatible with the capabilities of the system and do not unreasonably interfere with natural processes of erosion and sedimentation, and to encourage the restoration and enhancement of disturbed or modified beach systems.

- To manage intertidal flats so as to preserve their value as a nutrient souce and reservoir, a healthy shell fish habitat and a valuable feeding area for invertebrates, fish and shore birds; to encourage the restoration and enhancement of degraded intertidal flats; to allow coastal uses that minimize change in the natural current flows, depth, slope, sedimentation and nutrient storage functions, and to disallow uses that substantially accelerate erosion or lead to significant despoilation of tidal flats.

- To preserve tidal wetlands and to prevent despoilation and destruction thereof in order to maintain their vital natural functions; to encourage the rehabilitation, restoration of degraded tidal wetlands and, where feasible, and environmentally acceptable, to encourage the creation of wetlands for the purposes of shell fish and fin fish managment, habitat creation and dredge spoil disposals.

- To promote, through existing state and local planning, development, promotional and regulatory programs, the use of existing developed shore front areas and marine-related uses, including, but not limited to, commercial and recreational fishing, boating and other water-dependent commercial, industrial and recreational uses.

- To regulate shoreland use and development in a manner which minimizes adverse impacts upon adjacent coastal systems and resources.

- To maintain the natural relationship between eroding and depositional coastal land forms and to minimize the adverse impacts of erosion and sedimentation on coastal land uses through

TABLE VI-4 (Cont'd)

The promotion of nonstructural mitigation measures. Structural solutions are permissible when necessary and unavoidable for protection of infrastructural facilities, water dependent uses or existing inhabited structures, and where there is no feasible, less environmentally damaging alternative and where all reasonable mitigation measures and techniques have been provided to minimize adverse environmental impacts.

Source: Connecticut Coastal Zone Managment Act

TABLE VI-5

PRESENT STATE AND MUNICIPAL AUTHORITIES FOR THE MANAGEMENT AND REGULATION OF COAL TERMINALS AT NEW HAVEN

USES AND ACTIVITIES MANAGED	STATE AND MUNICIPAL MANAGEMENT/REGULATORY STATUTORY AUTHORITIES	PROVISIONS OF AUTHORITIES	ADMINISTERING AGENCY
1. All structures and fill in tidal or coastal waters	Coastal Structures Law CGS Sec. 25-7B to 25-7F. Conn. Coastal Management Act, (P.A. 79-535) Sec. 21.	All structures, filling and work incidental thereto, in all tidal and coastal waters seaward of the mean high water mark, require a permit.	DEP-Water Resources Unit.
2. All dredging and removal of sand and gravel from tidal or coastal waters	Coastal Dredging Law CGS Sec. 25-10 to 25-18 Conn. Coastal Management Act, (P.A. 79-535) Sec. 21.	The taking and removal of sand, gravel or other materials from lands under tidal and coastal waters seaward of the mean high water mark, requires a permit.	DEP-Water Resources Unit.
3. All activities in tidal wetlands	Tidal Wetlands Law CGS Sec. 22a-28 to 22a-35. Municipal Ordinances CGS Sec. 7-148. Conn. Coastal Management Act, (P.A. 79-535) Sec. 7 to 10; Sec. 11 to 15; Sec. 21.	All uses/activities associated with a coal terminal project require permits.	DEP-Water Resources Unit.
4. All construction activities in or alteration of inland wetlands and watercourses	Inland Wetland and Watercourses Law CGS Sec. 22a-36 to 22a-45. RCSA Sec. 22a-39-1 to 39-13.2. Conn. Coastal Management Act (P.A. 79-535) Sec. 21. Municipal Regulations per CGS Sec. 22a-42(e) and 22a-42a. Conn. Coastal Management Act (P.A. 79-535) Sec. 11 to 15 and Sec. 7 to 10.	All uses/activities associated with a coal terminal project require permits.	DEP-Water Resources Unit and Municipality
5. Construction in and alteration of flood and erosion prone areas	Flood Encroachment Lines Program CGS Sec. 25-41 to 25f. Conn. Coastal Management Act. (P.A. 79-535) Sec. 21. Zoning CGS Sec. 8-2. Waterway Encroachment Line Ordinances. CGS Sec. 7-147. Conn. Coastal Management Act (P.A. 79-535) Sec. 11 to 15 and 7 to 10.	Lines are determined by DEP, along shorelines of any tidal or inland waterway or flood prone area considered for stream clearance or any form of flood control or flood alleviation measure, within which any obstruction, encroachment or hinderance require permits.	DEP-Water Resources Unit and Municipality

TABLE VI-5 (Cont'd)

USES AND ACTIVITIES MANAGED	STATE AND MUNICIPAL MANAGEMENT/REGULATORY STATUTORY AUTHORITIES	PROVISIONS OF AUTHORITIES	ADMINISTERING AGENCY
6. All uses significantly polluting the waters of the state	Water Pollution Control Laws CGS. Sec. 25-26 to 25-27 Sec. 25-54a to 25-54q Sec. 25-54aa. Conn. Coastal Management Act (P.A. 79-535) Sec. 20. Water Quality Planning CGS Sec. 25-54c Fed. Clean Water Act (PL 92-500) Sec. 208 and 303(e). Conn. Coastal Management Act (P.A. 79-535) Sec. 20.	Any source, actual or potential, of water contamination for all waters of the state including groundwater, is subject to pollution abatement orders and requires permits.	DEP-Water Compliance
7. All sewer lines, sewage treatment plants and municipal sewer avoidance programs	Water Pollution Control Laws CGS Sec. 25-2g; 25-54b; 25-54g; 25-54i; 25-54o to 25-54z. State Grants for Pollution Abatement Facilities CGS Sec. 25-54r to 25-54z. Conn. Coastal Management Act (P.A. 79-535) Sec. 21. Municipal Sewer Avoidance Programs CGS Sec. 7-153. Conn. Coastal Management Act (P.A. 79-535) Sec. 11 to 15 and Sec. 7 to 10.	DEP establishes regulations for municipal administration of sewer avoidance programs and facilities. (Program is voluntary).	DEP-Water Compliance Unit and municipal Water Pollution Control Authorities
8. All uses significantly polluting the air resources of the state	Air Pollution Control Laws CGS. Sec. 19-505 to 19-522. RCSA Sec. 19-508-1 to 19-508-100. Conn. Coastal Management Act, (P.A. 79-535Z) Sec. 21.	Any source of air contamination for the state's entire outdoor atmosphere requires a permit.	DEP-Air Compliance Unit
9. All navigation channels	Coastal Dredging Laws CGS Sec. 25-10 to 25-18. Channels CGS Sec. 25-3d. Conn. Coastal Management Act (P.A. 79-535) Sec. 21.	All vessels and all harbors of Long Island Sound are subject to regulation.	Dept. of Transportation and local harbor masters subject to DOT supervision
10. All sea lanes, port navigation and anchorage patterns	Boating Laws CGS Sec. 15-121 to 15-157. Harbor Navigation Laws CGS. Sec. 15-1 to 15-31. Conn. Coastal Management Act, (P.A. 79-535) Sec. 21.	DEP designates and lays out channels and boat basins in lands under tidal and coastal waters for access to and from deep water to uplands.	DEP-Water Resources Unit

TABLE VI-5 (Cont'd)

USES AND ACTIVITIES MANAGED	STATE AND MUNICIPAL MANAGEMENT/REGULATORY STATUTORY AUTHORITIES	PROVISIONS OF AUTHORITIES	ADMINISTERING AGENCY
11. Harbor and port developments	Coastal Structures Law CGS. Sec. 25-7b to 25-7f. Coastal Dredging Law CGS. Sec. 15-1 to 15-31. Conn. Coastal Management Act (P.A. 79-535) Sec. 21.	SEE ITEM 1	
	State Port Development CGS. Sec. 13b-53 State Grants-in Aid for for Harbor Improvement CGS Sec. 13b-57. Conn. Coastal Management Act (P.A. 79-535) Sec. 20.	Any town may establish a port authority to manage that district. The port authority must prepare a comprehensive plan for the development of port facilities in such district. Port facilities include wharfs, docks, piers, railroad tracks or terminals, warehouses and elevators, and the establishment and operation of a port and any other works, properties, buildings, structures, or other facilities necessary or desirable in connection with the development and operation of port facilities.	Port Authority
	Municipal Harbor Improvement Agencies. CGS. Sec. 13b-56 to 13b-57 Municipal Port Development CGS. Sec. 7-329c. Conn. Coastal Management Act (P.A. 79-535) Sec. 11 to 15 and Sec. 7 to 10.	The Harbor Improvement Plan is an outline of proposed harbor improvement for the harbor area of a coastal municipality. Harbor improvement projects include the development, improvement, construction and installation of berthing areas and channels to these areas; seawalls, piers, and docks; navigation aids; bridges; and other harbor related facilities and structures. Plan contents are subject to a public hearing requirement and must be approved by the planning commission or combined planning-zoning commission and the Commissioners of DEP and DOT before adoption by the municipal legislative body. Amendments to the plan must be approved by the commissions and individuals listed above and have the consent (in writing) of each purchaser or lessee of land in the harbor improvement project affected by the proposed modification.	Harbor Improvement Agency

TABLE VI-5 (Cont'd)

USES AND ACTIVITIES MANAGED	STATE AND MUNICIPAL MANAGEMENT/REGULATORY STATUTORY AUTHORITIES	PROVISIONS OF AUTHORITIES	ADMINISTERING AGENCY
12. All buildings, structures and uses (except those minor projects exempted by the municipality)	Zoning Laws CGS. Sec. 8-2 Municipal Ordinances CGS. Sec. 7-148. Conn. Coastal Management Act (P.A. 79-535) Sec. 11 to 15 and Sec. 7 to 10.	All activities, structures, uses, and buildings within the limits of a municipality which are not subject to other specific municipal land use regulations (e.g., Planned Unit Development regulations) are subject to municipal zoning regulations. The zoning commission is authorized to regulate the height, number of stories and size of buildings and other structures; the percentage of the area of the lot that may be occupied; the size of yards, courts, and other open spaces; the density of population; the location and uses of buildings, structures and land for trade, industry, residence or other purposes; and the height, size, and location of advertising signs and billboards.	Zoning Commission or combined Planning Zoning Commission
		Within zoning districts, certain classes or kinds of buildings, structures or uses of land are permitted only if a special permit has been obtained from the zoning commission, planning commission, combined planning-zoning commission or zoning board of appeals. Types of buildings, structures or uses requiring a special permit are enumerated in the zoning ordinance. Prior to granting a special permit, the appropriate commission must hold a public hearing (CGS Sec. 8-3c).	Zoning Commission or Planning Commission or combined Planning-Zoning Board of Appeals
		A. Municipal Site Plan Review Applications for special exceptions for activities or projects located fully or partially within the coastal boundary will be subject to coastal site plan review requirements of the Connecticut Coastal Management Act. Sec. 11(b). Site Plans shall include the plans, descriptions and assessments outlined in Sec. 11(c) of Connecticut Coastal Management Act. The appropriate commission shall, in addition to the discretion granted in	

TABLE VI-5 (Cont'd)

USES AND ACTIVITIES MANAGED	STATE AND MUNICIPAL MANAGEMENT/REGULATORY STATUTORY AUTHORITIES	PROVISIONS OF AUTHORITIES	ADMINISTERING AGENCY
		Sec. 8-3(g) of the CGS, approve, modify, condition or deny the project proposed in the site plan on the basis of criteria listed in Sec. 12 of the Connecticut Coastal Management Act to insure that the potential adverse impacts on both coastal resources and future water dependent development activities are acceptable. B. Municipal Coastal Program If a municipality opts to prepare a Municipal Coastal Program, the lists of uses, structures, buildings, etc. requiring a special permit in districts within the Coastal area shall be revised to insure that they conform to and effectuate the goals and policies.	

Source: Connecticut Coastal Zone Management Program Final Environmental Impact Statement

TABLE VI-6

THE CITY OF NEW HAVEN
CRITERIA USED TO EVALUATE SPECIAL EXCEPTIONS

- The nature of the proposed site, including its size and shape and the proposed size, shape and arrangement of structures.
- The resulting traffic patterns and adequacy of proposed off street parking and loading.
- The nature of the surrounding area and the extent to which the proposed use or feature might impair its present and future development.
- The proximity of dwellings, churches, schools, public buildings and other places of public gathering.
- All standards contained in zoning ordinance (standards that apply to coal terminal development are as follows: noise, vibration, air pollution and fire and explosion hazard).
- The comprehensive plan of the City of New Haven, and other expressions of the purpose and intent of the ordinance.

Source: New Haven Zoning Ordinance

TABLE VI-7
CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
COASTAL AND MARINE WATERS STANDARDS FOR
CLASS SB WATERS

Suitable for bathing, other recreational purposes, industrial cooling and shelfish harvesting for human consumption after depuration; excellent fish and wildlife habitat; good aesthetic value

1. Dissolved oxygen	No less than 5.0 mg/l at any time.
2. Sludge deposits - solid refuse - floating solids, oils and grease - scum	None except for small amounts that may result from the discharge from a waste treatment facility providing appropriate treatment.
3. Sand or silt deposits	None other than of natural origin except as may result from normal agricultural, road maintenance, construction activity, or dredge material disposal provided all reasonable controls are used.
4. Color and turbidity	A Secchi disc shall be visible at a minimum of 1 meter; Class SB_b-criteria may be exceeded. (See Note 6)
5. Coliforms bacteria per 100 ml	Fecal coliform shall not exceed a log mean of 200 organisms/100 ml nor shall 10% of the samples exceed 400 organisms/100 ml.
6. Taste and odor	None in such concentrations that would impair any usages specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
7. pH	6.8 - 8.5
8. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case exceed 83°F or in any case raise the normal temperature of

TABLE VI-7 (Cont'd)

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
COASTAL AND MARINE WATERS STANDARDS FOR
CLASS SB WATERS

	the receiving water more than 40°F. During the period including July, August and September, the normal temperature of the receiving water shall not be raised more than 1.5°F unless it can be shown that spawning and growth of indigenous organisms will not be significantly affected.
9. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, or impair the water for any other usage assigned to this class. (See General Policy 11).

Source: Connecticut Department of Environmental Protection

TABLE VI-8

NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER

Pollutant	Averaging time	Primary Standard	Secondary Standard
Particulate	Annual (geometric mean)	75 ug/m^3	60 ug/m^3
	24-hour	260 ug/m^3	150 ug/m^3
	3-hour	--	--

Source: Federal Register/Vol. 44, No. 113/Monday, June 11, 1979, Pages 33605-9

TABLE VI-9

COAL TERMINAL RECOMMENDED DEVELOPMENT GUIDELINES

ACTIVITIES	RECOMMENDED DEVELOPMENT GUIDELINES
CONSTRUCTION	
o Dredging, Dredged Material Disposal and Off Shore Construction	o Activities shall be consistent with Federal, State and municipal laws, programs, policies and plans.
	o Activities shall be planned and scheduled to minimize environmental impacts by scheduling these activities during periods when the environment is less susceptible to stress (eg, avoid fish spawning seasons).
	o Construction methods that minimize environmental stress (eg, turbidity and resuspension of sediments) shall be utilized if possible (eg, hyudraulic dredging).
	o Activities shall not present a risk hazard to marine traffic.
	o Activities shall interfere minimally with marine traffic and other port uses.
	o Activities shall not introduce debris or pollutants (oil, gasoline, etc.) into the water.
	o Safety measures (such as the use of booms when oil or diesel spillage is possible) shall be employed as necessary.
	o Mitigative measures shall be utilized to the greatest extent practicable to reduce negative impacts.

TABLE VI-9 (Cont'd)

COAL TERMINAL RECOMMENDED DEVELOPMENT GUIDELINES

ACTIVITIES	RECOMMENDED DEVELOPMENT GUIDELINES
o Land Clearing, Shipment of Supplies, Piling Placement, Construction of Operating Equipment	o Activities shall be consistent with Federal, State and municipal laws, programs, policies and plans. o Activities shall be planned and scheduled to minimize environmental impacts by scheduling these activities during periods when the environment is less susceptible to stress, (eg, earth moving to occur during the dry months) o Surface runoff that may increase and cause erosion and carry pollutants shall be controlled (eg, with dikes, booms, etc,) as necessary to ensure that the rate and volume of runoff does not increase. o Possible sources of leachate contamination (eg, small discharges of oil, grease, gasoline, etc) shall be avoided through the management of onsite storage of materials and activities. o Noise and vibration associated with activities shall not exceed standards established for nuisance and be mitigated where possible. o Dust generated by construction activities shall be controlled by the use of dust mats, wet suppression or other means to the greatest extent practicable.

TABLE VI-9 (Cont'd)

COAL TERMINAL RECOMMENDED DEVELOPMENT GUIDELINES

ACTIVITIES	RECOMMENDED DEVELOPMENT GUIDELINES
	o Aesthetic impacts associated with construction activities shall be minimized to the greatest extent practicable.
	o Mitigative measures shall be utilized to the greatest extent practicable to reduce negative impacts.
ONSITE COAL HANDLING	
o Ship Loading and Unloading, Rail and Truck Loading, And Stockpiling and Reclaiming	o Activities shall be consistent with Federal, State and municipal laws, programs, policies and plans
	o Activities shall be planned and scheduled to minimize environmental impacts by scheduling these activities during periods when the environment is less susceptible to stress (eg, loading/unloading may be postponed on windy days).
	o Fugitive dust shall be controlled with Best Available Control Technology (BACT)* mitigative measures.
	o Water runoff shall be controlled and managed.
	o Noise shall be controlled and mitigative measures shall be utilized to reduce noise to acceptable levels.

* "Best available control technology" means an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of such pollution.

TABLE VI-9 (Cont'd)

COAL TERMINAL RECOMMENDED DEVELOPMENT GUIDELINES

ACTIVITIES	RECOMMENDED DEVELOPMENT GUIDELINES
	o Aesthetic impacts shall be avoided but when this is not possible, a mitigation plan shall be implemented.
TRANSPORTATION	
o Ship, Rail and Truck Movements	o Activities shall be consistent with Federal, State and municipal laws, programs, policies and plans.
	o Activities shall be planned and scheduled to minimize environmental impacts by scheduling these activities during periods when the environment is less susceptible to stress (eg, noise generating activities may be avoided at night).
	o Fugitive dust shall be controlled during all loading/unloading activities with BACT mitigative measures (eg, telescoping chutes).
	o Marine risk hazards shall be avoided through the use of detailed plans and procedures.
	o Safety measures (such as the use of booms when oil or diesel spillage is possible) shall be employed as necessary.
	o Noise shall be controlled and mitigative measures shall be utilized to reduce noise to acceptable levels.
	o Traffic impacts shall be avoided through planning and activities management.

Source: Envirosphere Company

TABLE VI-10

COAL TERMINAL EVALUATIVE CRITERIA

ACTIVITIES	EVALUATIVE CRITERIA
CONSTRUCTION	
o Dredging, Dredged Material Disposal and Off Shore Construction	o Are the proposed activities allowable pursuant to Federal, State and municipal laws, programs, policies and plans?
	o Have a schedule and plan for the proposed activities been established? Will these ensure that the proposed activities are executed during periods when the environment is less susceptible to stress?
	o Are construction methods and project design features that minimize environmental stress proposed?
	o To what extent will the proposed activities cause positive and negative aesthetic impacts?
	o To what extent will proposed activities present an increased risk hazard to marine traffic?
	o To what extent will the proposed activities interfere with marine traffic and other port uses?
	o If necessary, to what extent will safety measures be employed to reduce potential environmental impacts?
	o What are the positive environmental impacts that may result from the proposed activity?

TABLE VI-10 (Cont'd)

COAL TERMINAL EVALUATIVE CRITERIA

ACTIVITIES	EVALUATIVE CRITERIA
	o To what extent will mitigative measures be employed to reduce negative impacts?
	o To what extent will the proposed activities benefit other uses in the port area, the City and the State?
	o What are the positive (eg, jobs, tax revenue) and negative (eg, municipal costs, preempted revenues) socio-economic impacts of the proposed activities?
o Land Clearing, Shipment of Supplies, Piling Placement, Construction of Operating Equipment	o Are the proposed activities allowable pursuant to Federal, State and Municipal laws, programs, policies and plans?
	o Have a schedule and plan for the proposed activities been established? Will these ensure that the proposed activities are executed during periods when the environment is less susceptible to stress?
	o Are construction methods and project design features that minimize environmental stress proposed?
	o To what extent will the proposed activities cause positive and negative aesthetic impacts?
	o What are the positive environmental impacts that may result from the proposed activity?

TABLE VI-10 (Cont'd)

COAL TERMINAL EVALUATIVE CRITERIA

ACTIVITIES	EVALUATIVE CRITERIA
	o To what extent will mitigative measures be employed to reduce negative impacts?
	o To what extent will the proposed activities benefit other uses in the port area, the City and the State?
	o What are the positive and negative socie-economic impacts of the proposed activity?
ONSITE COAL HANDLING	
o Ship Loading and Unloading, Rail and Truck Loading, and Stack Piling and Reclaiming	o Are the proposed operations allowable pursuant to Federal, State and Municipal laws, programs, policies and plans?
	o Will Best Available Control Technology (BACT) be utilized to minimize fugitive dust emissions?
	o Will water runoff within operations areas be managed in an environmentally appropriate manner?
	o Will noise and vibration be managed in an environmentally appropriate manner?
	o To what extent will the proposed operations cause positive and negative aesthetic impacts?

TABLE VI-10 (Cont'd)

COAL TERMINAL EVALUATIVE CRITERIA

ACTIVITIES	EVALUATIVE CRITERIA
	o What are the positive environmental impacts that may result from the proposed operations?
	o To what extent will the proposed operations benefit the port, the City, and the State?
	o What are the positive and negative socio-economic impacts of the proposed operation?
TRANSPORTATION	
o Ship, Rail and Truck Movements	o Are the proposed operations allowable pusuant to Federal, State and Municipal laws, programs, policies and plans?
	o To what extent will increases in marine traffic increase the potential for collisions, groundings and other accidents?
	o To what extent will increases in rail traffic negatively impact emergency vehicle access and delay normal traffic patterns?
	o To what extent will increases in truck traffic increase road maintenance requirements?
	o Will noise and vibration be managed in an environmentally appropriate manner?

TABLE VI-10 (Cont'd)

COAL TERMINAL EVALUATIVE CRITERIA

ACTIVITIES	EVALUATIVE CRITERIA
	o To what extent will the proposed operations cause positive and negative aesthetic impacts?
	o What are the positive environmental impacts that may result from the proposed operations?
	o To what extent will the proposed operations benefit the port, the City, and the State?
	o What are the positive and negative socio-economic impacts of the proposed operation?

Source: Envirosphere Company

SECTION VII

CONCLUSIONS AND RECOMMENDATIONS

New or expanded coal terminal development at New Haven Port is not expected to occur in the near term, based on an assessment of the present and oil projected demand for coal. However, should world oil prices increase and availability decrease, the demand for coal within the region served by New Haven Port could increase. In this case, the Port could support a small coal terminal (see Table II-4 for a description of the low scenario) to serve industrial, commercial and residential needs. A terminal of this scale would require approximately 3 acres. Based on an evaluation of nine sites, two were determined to be promising potential sites for small coal terminal development of this nature. These sites are noted as D and E on Figure 1.

It is judged that a larger coal terminal development (see Table II-4 for a description of the medium scenario) could only become necessary if a larger industry, such as an electric utility (e.g., the Middletown plant) required coal (the Middletown plant is not anticipated to convert at this time). Should this occur, a moderately sized coal terminal of approximately ten acres could be accomodated at the site designated B and part of A on Figure 1. Both terminal development scenarios represent "import" type facilities. A coal "export" terminal is not expected to locate at New Haven Port.

Should any coal terminal development occur at New Haven Port, the coal storage systems that are most likely to be utilized are open ground storage and silo storage. Open ground storage is less expensive, more flexible, and represents less potential for spontaneous combustion, and greater potential for environmental impacts than silo storage. Silos require higher soil strength (to sustain heavier concentrated loads than those encountered with open ground storage) and usually an absence of shallow groundwater (as a siting requirement) due to its tunnel requirement. Both coal storage systems, as with the other elements of a coal terminal, present a host of potential environmental impacts.

Impacts to air quality, water quality, terrestrial ecology and aesthetics represent some of deleterious consequences that may potentially occur from coal terminal construction and operation. To a large extent, these impacts may be avoided through proper planning and the existing management and regulatory framework which is comprised of laws, programs, policies, guidelines and standards enacted at the federal, state and municipal levels of government. In addition to having a major influence in terms of whether and where a coal terminal may locate, these management and regulatory mechanisms can significantly influence how a project is developed and designed.

Mitigative measures to avoid or reduce the deleterious consequences of coal terminal development may be required or negotiated during the early planning stages of a coal terminal project. Mitigative measures should be considered and incorporated to the greatest extent practicable, when necessary. Development of a coal terminal without mitigative measures would degrade the water quality, air quality, terrestrial ecology and aesthetic environment of the New Haven port area. The degree to which mitigative measures are incorporated into a project proposal depends to a large extent on the project review processes performed by government.

The Connecticut Coastal Zone Management Act and the program authorized by its enactment created a comprehensive management and regulatory framework. The coastal site plan review process, conducted at all government levels where a permit decision is required, calls for projects to be consistent with a uniform set of state adopted, broadly defined, goals and policies. This mechanism, by itself, has the potential to be effective in assuring that coal terminal development in New Haven is, properly constructed, designed and operated.

At the municipal level, the New Haven Zoning Ordinance requires that a special exception be granted by the Board of Zoning Appeals for any coal terminal development proposed in port areas zoned for heavy industrial use. The advisory report required, (prior to an administrative decision concerning a special exception), together with the coastal site plan

review, provide ample opportunity to consider the ramifications of a coal terminal proposal, provided that sufficient information about the proposal is provided. Section 55 of the New Haven Zoning Ordinance requires general information which may not ensure that the detailed characteristics, ramifications, and mitigative measures of a proposal are disclosed.

For the most part, the significant environmental consequences of a coal terminal proposal would be evaluated as part of the permit review processes. Air, water, dredging, and construction permits could be required for a coal terminal, depending on the nature of the project. As mentioned earlier, a coastal site plan review would be conducted at each level of government where a permit is required. The degree to which federal and state review processes reflect the priorities for Port development established by the City of New Haven cannot be assessed here. However, even if the City of New Haven's review processes were conducted to ensure conformance with state coastal zone adopted goals, policies etc., a well planned and cohesive development pattern in New Haven could not be assured. It is therefore recommended that the City establish a port master plan that may serve as a basis for the evaluation of development proposals.

Development guidelines and evaluative criteria presented herein are intended to assist project sponsors and reviewers repectively in the event a coal terminal proposal is put forward. These "tools" cannot, however, substitute for a planning process to achieve desired development patterns in New Haven. Such a process might utilize: 1) a detailed, regularly revised, master plan (present and future); 2) a comprehensive and detailed set of port goals, objectives, policies, and development guidelines; 3) ordinances with detailed standards which are consistent with items 1 and 2; and, an enforcement mechanism to ensure that all of the above are maintained.

REFERENCES

- City of New Haven, Connecticut, Zoning Ordinance Title VI, Volume III of the Code of the City of New Haven, 1981, 250 pp (approx.).

- City of New Haven, Connecticut, Office of Downtown and Harbor Development, New Haven Coastal Program, September 1982, 150 pp (approx.).

- City of New Haven, Connecticut, New Haven Code, undated.

- Connecticut Department of Environmental Protection Connecticut Water Quality Standards and Criteria, June 1982, 50 pp (approx.).

- Connecticut Department of Environmental Protection, Coastal Policies and Use Guidelines, Planning Report No. 30, December 1979, 200 pp (approx.).

- Connecticut Office of Policy and Management Connecticut Coastal Energy Impact Program: Port Rail Energy Transportatiion Planning Project Final Report, September 1980, 65 pp.

- Connecticut Office of Policy and Management Staff Report on Social, Environmental and Economic Impacts Resulting from Conversion of Electric Power Plants to Coal in the Connecticut Coastal Zone, undated, 100 pp (approx.).

- Envirosphere Company, New York, New York, Draft Environmental Report for the Virginia Port Authority Coal Terminal, March 1983, 600 pp (approx.).

. Michigan Department of National Resources, Coastal Effects of Coal Transhipment in Michigan: An Evaluation Strategy, October 1980, 300 pp (approx.).

. Michigan Department of Natural Resources, Michigan Coastal Storage, undated 119 pp.

. National Coal Association, Revised 1983 Forecasts, Washington, D.C., 1983.

. Osleb, J.P. and S.J. Ratick, Implications of Power Plant Coal Conversions on the Ports of New England, for the U.S. Maritime Administration Office of Maritime Technology, 1981.

. Soros Associates Consulting Engineers, New York, New York, Analysis of Some Design Alternatives for the Virginia Coal Terminal, September 1982, 37 pp (unpublished).

. U.S. Department of Commerce, Maritime Administration Office of Port and Intermodel Development, Port Handbook for Estimating Marine Terminal Cargo Handling Capability, Report No. MA-PORT-970-80013, September 1979, 229 pp.

. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, State of Connecticut Coastal Management Program and Final Environmental Impact Statement, June 1980, 600 pp (approx.).

. U.S. Department of Energy, 1981 Annual Report Report to Congress - Volume 3 - Energy Projections (DOE/EIA-0173), Washington, D.C., 1982.

. U.S. Department of Energy, Annual, Coal Distribution (DOE/EIA-0125), Washington, D.C.

. U.S. Department of Energy, 1982 Annual Report to Congress - Volume 3 - Supplement 2, (DOE/EIA-0173(81)/3(S-2)), 1981.

. U.S. Environmental Protection Agency, Office of Research and Development, The Environmental Impact of Coal Transfer and Terminal Operations, Report No. EPA-600/7-80-169, October 1980, 78 pp.

. Washington Public Ports Association, Potential Coal Export Facilities in Washington: An Environmental Impact Analysis, October 1982, 125 pp (approx.).

. Wisconsin Division of Energy, Coal Transportation to Wisconsin: An Overview, February 1982, 150 pp.

APPENDIX I

AIR QUALITY, WATER QUALITY AND NOISE QUALITY CONTROLS

The selection of mitigative measures to reduce potential environmental impacts from a coal terminal is dependent on the specific characteristics of the facility and the environment in which it will locate. In particular, the equipment and methods used to handle, store and transport coal, as well as the volume and characteristics of the coal itself, will dictate what mitigative measures may be used. However, currently available control techniques can be generally described for air quality, water quality, and noise quality control and these are presented below.

AIR QUALITY CONTROLS

Control of fugitive dust, the principal source of air quality impacts, may be accomplished by the following methods:

- Enclosed systems
- Dust collection
- Water, chemical sprays, surface coatings and coverings
- Surface Coating
- Containment equipment
- Compaction
- Barriers

These methods of control are briefly described below:

Enclosed Systems

Partial or complete enclosure of operations at a coal terminal facility may reduce or prevent air quality impacts. Enclosures may be designed for most facilities, including transfer towers, rotary car dumpers, feeder hoppers, loading barges, coal screens and crushers, and conveyors. Bins receiving coal from trucks can be enclosed by three side panels and a sloping roof. Curtains can be hung to partially close the remaining opening during truck dumping periods. Enclosures keep fugitive dust emissions from escaping to the general atmosphere.

Dust Collection

When enclosures are used to control fugitive dust, a dust collection system or device can be employed to collect and control the dust from individual transfer operations or transfer points. Whenever possible, it is important to return the collected coal dust to the product line,

thereby eliminating disposal problems and reducing product losses. Large enclosures often use central collection systems. Smaller transfer points can be more economically handled by devices designed to trap dust through filters. A dust collector may be positioned at a conveyor transfer point where reverse jets or compressed air is used to force dust cake off the collectors and back into the conveyors so that the coal dust stays within the coal handling system. The collected air stream containing dust can, in turn, be treated with air filters and scrubbers.

Water, Chemical Sprays, Surface Coatings and Coverings

Water with or without a chemical additive can be sprayed onto coal to reduce the volume of fugitive dust. The application of wet suppression may occur at specific points, including: the stock pile, at each transfer point in a conveyor network, and, in the rotary dumper prior to discharge. Crusting agents, cappings or coverings to prevent air from entering the stock piles, thereby reducing the quantity of fugitive dust emissions, are frequently used in coal terminals. Water soluable polymers which leave a dry film on the coal surface can provide protection from wind for several months. One advantage of wetting coal over collecting dust is that dust is never removed from the product stream. However disadvantages of wet suppression systems include:

- The moisture content of the coal increases, reducing the Btu value per ton;
- Higher maintenance costs are associated with this method; and
- Chemical additives, if used, represent an additional expense.

Portland Cement, Plaster of Paris, oil or salt sprays, asphalt and tar derivatives are other types of capping agents that may control particulate emissions. Most of the capping agents may be burnt off with the coal. Physical coverings, such as tarpaulins and plastic covers are also used on storage piles to minimize air-borne dust. However, when tarpaulins are used to cover coal piles, frequent monitoring is necessary to locate hot spots to prevent against spontaneous combustion.

Containment Equipment

Several devices are commercially used to reduce fugitive dust generated from free falling coal and from the influence of wind. Two such devices are: loading stacks and chutes which can be designed to be telescopic. A loading stack is a tube having doors located at different elevations on either side. These doors are kept closed and selectively opened to minimize the distance the coal is to fall from the opening to the top of the coal pile, conveyor, or bin. Minimizing the coal-falling distance also tends to minimize fugitive dust. Telescopic chutes are devices that may be adjusted to reduce the distance from where the coal is released (and exposed to the atmosphere) to the top of the coal pile, hold, or bin, thereby minimizing fugitive dust.

Compaction

Compacting of coal in stock piles reduces coal surface area exposed to the atmosphere, thereby reducing fugitive dust emissions. Compaction methods may however generate dust (i.e., coal movement tends to create dust), therefore these activities must occur at appropriate times (on days that are not windy).

Barriers

Fugitive dust can also be controlled by shielding stock piles from wind. Barriers that can be used for this purpose include:

- Air-tight retaining walls
- Storage of coal in bins, silos, bunkers, earthen pits
- Underwater storage
- Wind guards

To be effective, the height of such barriers must be greater than the height of the pile. A control method similar to the use of barriers is the use of pits or structures that are entirely or partially level or below surface. Storing coal in a pit not only reduces futivive dust, but can reduce the amount of coal spilled during loading and unloading.

WATER QUALITY CONTROLS

Water quality impacts from coal terminals are primarily a result of the precipitation of coal dust onto water bodies and/or the contamination of water bodies by coal pile leachate. Both sources of water quality impacts can be controlled.

Dust control is typically accomplished by wetting the surface of the coal either with water or with chemicals. These chemicals are usually water soluable polymers, which are sprayed to form a coating over the coal surface. In addition, water insoluable chemicals including different forms of asphalt and asphalt emulsions have been used to coat coal piles. By coating the coal with water or chemicals, fugitive dust emissions are greatly reduced, and the impact of dust emissions on water quality is also reduced.

The collection and treatment of coal pile leachate is a common practice at many terminal operations. Typically, the coal pile leachate is channeled to a pond or catch basin through a series of drainage ditches and is subsequently treated. Treatment usually includes restoring the pH to non-acidic levels, removal of suspended solids and frequently the addition of settling aids, such as lime or polymers, to remove suspended or precipitated solids. This process neutralizes excess acidity, precipitates out heavy metals and removes excess suspended solids. The following table presents typical treatment systems that are currently being used to control runoff from coal storage piles:

TYPICAL LEACHATE TREATMENT SYSTEMS

Collection and Treatment	Advantages/Disadvantages
Catch basin with provision to monitor over flow.	Effective only in reducing suspended impurities.
	Not suitable for reducing acidity or heavy metals.
Collection and reuse of runoff/leachate for spray systems.	Treatment required only for reducing suspended particles to protect against nozzle clogging.
Pit and berm storage of coal.	Provides positive containment of runoff/leachate.
	Improves aesthetic appearance; visible height of coal pile is reduced.

NOISE QUALITY CONTROLS

Methods to reduce or control noise levels from coal terminals are to: shield, enclose or insulate the noise source; and modify the noise source through vibration isolation or structural dampening. Commonly used noise reduction techniques include the following:

- Shielding or enclosing noise generators with barriers such as walls, panels, fences, vegetation or earth berms.
- Placing internal baffles in hoppers to encourage the coal to slide, rather than fall, onto hopper surfaces.
- Designing chute slopes to encourage sliding rather than bouncing.
- Using soft materials (e.g., Neoprene) or dashpot buffers on chutes and hoppers to reduce noise from mechanical impacts.
- Replacing metal conveyors at transfer points with canvas units, or reducing the height of the drops.
- Lining conveyor slides with plastic or fiberglass railing.
- Applying damping to the underside of conveyors, chutes, hoppers, etc.
- Using telescopic chutes for loading transportation equipment to reduce the distance coal is dropped.

Noise impacts from a coal terminal can also be reduced by limiting operations, which are perceived as being particularly noisy, to daylight hours only.